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Ontario Hardwood Silviculture Studies Database:

Metadata Report

Ontario

Ontario Forest Research Institute
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Ontario Hardwood Silviculture Studies Database:

Metadata Report

by

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This paper contains recycled materials.

Abstract

This report contains printed output of all descriptive information, or metadata, for the studies in the Ontario Hardwood Silviculture Studies Database available as of March 2003. The database includes more than 90 ongoing and historical hardwood silviculture studies and trials in Ontario, most of which were initiated by the Ontario Ministry of Natural Resources, the Canadian Forest Service, or forest industry. The criteria for inclusion in our database were that the study:

(1) occurred in Ontario;
(2) included some type of silvicultural treatments and measurements of the resulting regeneration success or growth responses; and
(3) focused on one or more of these hardwood tree species: sugar maple (*Acer saccharum* Marsh.), yellow birch (*Betula alleghaniensis* Britton), red oak (*Quercus rubra* L.), American beech (*Fagus grandifolia* Ehrh.), white ash (*Fraxinus americana* L.), black cherry (*Prunus serotina* Ehrh.), or basswood (*Tilia americana* L.).

For each of these studies, we provide all available project metadata, including a project overview, objectives, layout/design, study instigator and associated staff, current contact, silvicultural treatments, measurements, known or expected years of establishment, treatment, and measurement, review methods, comments, data locations, data quality, data stability, tree species, location of study, size, plot type, and known associated publications.

The database does not contain any original study field or laboratory data or analyses. If a database user is interested in accessing one or more data sets described in the database, the recommended procedure is to contact the individual listed as the *current contact* for that study to request the data and additional interpretive support.

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This project was funded by grants from the Ontario Living Legacy Trust and the Forestry Research Partnership. The authors thank the following individuals for assistance in locating and accessing study records: Harvey Anderson, Jim Rice, Murray Woods, Andrée Morneault, Steve D'Eon, Craig Robinson, and Jeff Kokes. Lisa Buse provided editing and production assistance. Graphics and layout support was provided by Trudy Vaittinen. Finally, the authors thank Dan McKenney, Lisa Verkley, and Guy Smith of the Canadian Forest Service for their cooperation and assistance in making the study metadata and bibliographic information contained in this report available as part of the Ontario Research Sites Database.

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Project Overview

The *Ontario Hardwood Silviculture Studies Database Project* was launched in 2001 to gather descriptive information, or *metadata*, about hardwood silviculture studies in the province, and to organize and make that information readily available. More than 90 studies met our selection criteria for inclusion in the database; most of these were initiated by the Ontario Ministry of Natural Resources, the Canadian Forest Service, or forest industry. The inclusion criteria were that the study:

(1) occurred in Ontario;
(2) included some type of silvicultural treatments and measurements of the resulting regeneration success or growth responses; and
(3) focused on one or more of the following hardwood tree species: sugar maple (*Acer saccharum* Marsh.), yellow birch (*Betula alleghaniensis* Britton), red oak (*Quercus rubra* L.), American beech (*Fagus grandifolia* Ehrh.), white ash (*Fraxinus americana* L.), black cherry (*Prunus serotina* Ehrh.), or basswood (*Tilia americana* L.).

The metadata associated with these projects have a number of important uses, particularly when collected, organized, and presented in a single source like a searchable relational database. First, the information can be used by researchers to identify and locate studies and datasets that may be of use to help answer specific science questions. A prior study may help to refine or direct a new study by providing supporting evidence or related results. As well, data and analyses from existing studies and/or published results may minimize the need for initiating a new study. The researcher may use data from a prior or ongoing study, either in its current form or through remeasurement or reanalysis, to address the science need. Similarly, research managers can use the metadata to help determine whether to fund proposed studies.

Second, readily accessible metadata can help practitioners, i.e., field foresters, to quickly and efficiently determine if a regional study has been completed and reported on that provides useful applied information to a current forest management or silviculture science gap. Even if not designed to answer a specific current question for a given site or practice, the information from a former study that is made available in this way could provide at least some scientific foundation for a decision that cannot wait the years necessary for results from a new field study.

Third, current provincial and federal forest science resources are insufficient to fully maintain all of the active high-quality hardwood silviculture studies in central Ontario. Using this database, OMNR and CFS science staff can more efficiently and effectively review, evaluate, prioritize, and schedule those studies for future maintenance, treatment, and measurement investments. Similarly, they can identify studies that do not meet certain minimum data or field criteria and terminate them.

The fourth significant application of the completed metadata database is to provide descriptive and spatial information on high-value hardwood silviculture studies in central Ontario to values-mapping and information-sharing efforts such as the Ontario Natural Resources Values Information System (NRVIS) and the federal Forest Ecosystem Research Network of Sites (FERNS). This will help to communicate the existence and values of these long-term research projects to a wider audience, and will help to protect such sites from inadvertent damage or loss due to resource or land use management decisions made without this knowledge.

Through consultation with government science staff and forest industry project partners, we identified the following metadata criteria for study screening and inclusion in the database:

- names and contact information of people who initiated the study, as well as those who are or were involved in the study;
- study name and its pseudonyms;
- study location and geographical extent;
- study objectives;
- layout/design;
- study site and tree species information;
- types and years of field experimental treatments;
- types and years of field measurements;
- scheduled future treatment and measurement years;
- location(s), storage formats, levels of annotation, and relative condition of the data sets; and
- bibliographic citations for known publications that were derived from the study data.

No attempt was made or is implied to collect, store, organize or distribute any original study data as part of this project. Our premise was that we would provide descriptive and evaluative information about a study and its associated data. To access a particular dataset, the person listed as the *current contact* for the study should be contacted to initiate a discussion about the intended uses for the data, the applicability of the data for that use, and to formalize a request for the actual transfer of data if appropriate. Similarly, no direct or implied permission to access or otherwise use the study sites is referred to in the database. Site visit requests should also be directed to the current contact person to avoid any possible disruption or damage to ongoing research.

In addition to the study metadata search and selection process, we performed an extensive literature search to locate any additional material, published or unpublished, related to studies in the database, or resulting from hardwood studies for which metadata is not available. Examples of the latter include studies initiated by universities or private sector organizations, which were beyond the scope of the present study. Literature was included only if the study from which it came met our criteria (above). A total of 324 publications and other products are included in the publications section of the database.

Project Deliverables

The *Ontario Hardwood Silviculture Studies Database Project* resulted in three products. The first published report was an annotated bibliography, titled *Ontario Hardwood Silviculture Studies Database: Annotated Bibliography*, Forest Research Information Paper No.153. This report contains a printed version of all bibliographic entries and annotations in the database as of March 2003, with subject and author indexes.

This report is the second product: it contain all available metadata fields for the studies included in the *Ontario Hardwood Silviculture Studies Database* as of March 2003. It is organized by study category and includes a subject index.

The third product is the *Ontario Hardwood Silviculture Studies Database*, which is a digital database that contains all of the information in the printed reports. The database has been converted from its original MS Access 97 format and uploaded into the Ontario Research Sites (ORS) Database, hosted by the Canadian Forest Service (available at http://www.glfc.cfs.nrcan.gc.ca/ors).

About the Database

Organization of studies

Studies were organized by primary tree species, study number, and stand development stage by assigning a unique 4-digit index number to each study (e.g., 1.01.2). The first digit refers to the primary tree species focus of the study, coded as follows:

1- Sugar maple (primary) with associated species
2- Yellow birch (primary) with associated species
3- Red oak
4- Other mid-tolerant species (basswood, black cherry, white ash)

The second and third digits comprise a numerical study identifier that is unique within the respective species group category. The last digit represents the primary stand age or degree of stand development relative to the study objectives, coded as follows:

1- regeneration/stand establishment
2- intermediate/pre-commercial
3- mature and old growth

Studies in this report are sorted first by species, then by the numerical index.

Field studies and associated publications

Wherever possible, we identified all publications and/or other communications products that were developed using results from a given study. For each study, full bibliographic citations for all related publications are listed in the *publications* data field.

Studies with available data and intact field sites

The potential ongoing research value of the 93 studies identified in this report were evaluated and ranked based on: 1) the archived data activity, quality, and stability, and 2) the field plot integrity. Data activity, quality and stability were assessed by project field staff during the original data collection phase of the hardwood synthesis project and were evaluated in consultation with those actively involved in study if available. Studies were included in Table 1 if they met minimum criteria for each of following metadata categories.

Data activity indicates how frequently the data are accessed, with an active and regularly maintained data set assumed to be of higher value and more readily accessible than an inactive data set. Data activity was coded to one of five classes; with only those studies in classes 1-3 included in Table 1:

1. Active Regular - data set regularly updated and maintained
2. Active Irregular - data set irregularly updated and maintained
3. Inactive Available - data set static but available
4. Inactive Unavailable - data set static, and data are wholly or partially lost
5. Unknown

Data quality is an indication of the level of quality control used when the study data were originally collected. This variable was assessed during interviews with the study contact person and by inspection of the field data records. It includes an assessment of the skill and training levels of the original field data collection crew, level of documentation and direction communicated to the field data collection crew, and the known or apparent rigour of the field data collection. Data quality was coded to one of five classes; with only those studies in classes 1-2 included in Table 1.

1. Excellent - field data crew was highly skilled and instructed; high confidence in data quality
2. Good - field data crew was skilled; medium-high confidence in data quality
3. Fair - field data crew was moderately skilled; some confidence in data quality
4. Poor - field data crew was inexperienced, poorly trained or poorly instructed; low confidence in data quality
5. Unknown - person with knowledge of field data crew skill, instruction and execution of data collection either unsure of data quality or was unavailable to our project staff

Data stability is an indication of how secure data are in thier current storage format. Data stability classified into one of five classes with only studies in classes 1-3 included in Table 1.

1. Very Stable - data in relatively recent digital format, backed up digitally; with printed copy(ies); data well annotated
2. Moderately Stable - data in relatively recent digital format; with printed copy(ies)
3. Moderately Unstable - data in relatively old or obsolete digital format; poor printed copy(ies)
4. Very Unstable - data in relatively old or obsolete digital format; missing or damaged printed copy(ies)
5. Unknown

Field plot integrity is an assessment of the condition of the field plots, including whether or not the forest stand in which the study was established is still intact, and whether the field plots are adequately marked with paint, tree tags, corner and or centre posts, or other persistent plot markers and supporting archived records that would allow an appropriately skilled technician to reliably locate most of the plots. This assessment is based on either the principal study contact's personal knowledge of the field plots, or on the documented last date of data collection from the plots. Unless personal knowledge was provided to the contrary, plots with measurement date of 1996 or later were given a rating of 1; plots last visited and remeasured prior to 1996 were given a rating of 2. Field plot iintegrity was rated to one of four classes with class 1 or 2 required for inclusion in Table 1:

1. Good - plots intact, well marked
2. Fair - plots intact, may be well marked, some plots or markers incomplete
3. Poor - plots not intact or not well marked, likely unrecoverable
4. Unknown

Table 1. Ontario hardwood studies considered to have secure, high quality, stable data and intact, marked field plots. Studies are sorted by primary species group, and study number. No studies from the Other Hardwoods group in the full database met the data/plot integrity criteria.

Species group/Study number and title	Attribute					
Sugar maple	Data activity	Data quality	Data stability	Field plot integrity	Silviculture applied	Year last measured
1.01.3 Scott Lake stand improvement	1	2	1	2	y	1993
1.02.3 Swan Lake marking test plots	2	1	1	1	n	1995
1.05.3 Swan Lake tolerant hardwood stand dynamics	2	1	2	2	n	1990
1.08.3 Parkside Bay demonstration cutting trial	2	2	1	1	y	1999
1.09.3 Parkside Bay hardwood tree crown growth	1	1	1	1	y	2000
1.10.3 Parkside Gully selection study	1	1	1	1	y	1997
1.12.3 Corry Lake single-tree selection	1	2	1	1	y	1998
1.14.2 Trout Creek thinning	1	2	1	2	y	1991
1.15.2 Crop tree thinning	2	2	1	2	y	1989
1.17.3 Algonquin regional growth study (ARGS)	1	1	1	1	y	1994
1.18.3 Algonquin polar plots	1	1	1	1	y	1991
1.26.3 Silvicultural calibration of Algoma/North Shore stands (SCANSS)	2	1	2	2	y	1995
1.27.3 Central Region growth and yield network	1	1	1	1	n	2003
1.30.3 Westwind shelterwood PGP	1	1	1	1	y	2002
1.32.3 Influence of logging damage on growth and development	1	1	1	1	y	2001
1.35.3 Investigation of selection harvesting damage	1	1	1	1	y	2002
1.38.3 Turkey Lakes trial of SCANSS	2	1	1	1	y	1998
1.39.3 Management of tolerant hardwoods in Northern Ontario	2	2	2	1	y	1998
Yellow birch						
2.04.1 Yellow birch regeneration dynamics	3	2	3	2	y	1984
2.06.1 Group selection in tolerant hardwoods	2	2	2	1	y	2000
2.07.2 Yellow birch thinning	1	1	1	1	y	2001
2.22.2 Yellow birch and sugar maple thinning	3	2	2	2	y	1993

Table 1. Con't.

Species group/Study number and title	Attribute					
Red oak	Data activity	Data quality	Data stability	Field plot integrity	Silviculture applied	Year last measured
3.02.1 Establishing regeneration under a young red pine plantation utilizing different silvicultural techniques	2	1	1	2	y	1994
3.03.1 Management of existing natural regeneration under an overstory of red pine	2	1	1	2	y	1994
3.06.1 Repeated prescribed burns for red oak regeneration	1	1	1	1	y	1999
3.07.1 Regeneration tally of red oak using shelterwood harvest with prescribed burning or manual tending to control competition	1	1	1	1	y	2002
3.08.1 Clearcut harvest and two prescribed burns with planting of red oak	2	2	2	1	y	2000
3.10.1 Shelterwood harvest followed by planting and repeated prescribed burns to increase the red oak component	1	1	1	1	y	2000
3.11.1 Red oak underplanting and tending following shelterwood harvest	2	1	1	1	y	2000
3.16.1 Comparison of red oak restoration techniques	2	1	1	1	y	2000
3.23.1 Biennial repeated burns for red oak regeneration	2	2	1	1	y	2000
3.24.1 Operational prescribed burns to control competition and promote resprouting	2	2	1	1	y	2000
3.25.1 Operational prescribed burns to release red oak regeneration	2	2	2	1	y	2000
3.27.1 Herbicide injection to release red oak	2	1	1	1	y	1994

Contact Us

To submit comments, corrections, additions, or questions about the *Ontario Hardwood Silviculture Studies Database* or any of its related products, or to request copies of the other products described above, contact us by email at: information.ofri@mnr.gov.on.ca.
or mail: Ontario Forest Research Institute, 1235 Queen Street East, Sault Ste. Marie, ON P6A 2E5

Study Metadata

1.01.3 Scott Lake stand improvement

Study pseudonyms	66-1 and 66-2; Scott Lake cutting trial; Seven-year cutting cycle; Short cutting cycle
Study instigator	Mac McLean
Associated staff	Harvey Anderson
Current contact	William Cole
Abstract	This study is located on a drumlinized land form of good potential, supporting an overmature stand of tolerant hardwoods of variable quality and showing some age-related deterioration. To attempt rejuvenation of the stand, a modified selection regime was prescribed. Early observations of post-harvest growth suggested a 7-year cutting cycle might be appropriate for the initial cuts. Stimulation of in-growth recruitment was sought by retaining a relatively low basal area for this cutting cycle: normally, residual basal area is increased as cutting cycles are reduced. Study area was permanently delineated in 1989.
Objectives	To transfer growing space to better quality trees by harvesting "worst first", recognizing the need to leave occasional defective trees for wildlife.
Layout/design	Eight plots varying from 0.25 to 1.1 acres (0.1 to 0.4 ha). The entire area (5 ha) is being managed on a 12-year cutting cycle (4 cuts to date) after a series of improvement cuts. In 1990, the trees were tagged with individual successive numbers, 1 to 1429 for the upper plots and 1430 to 3403 for the lower plots.
Comments	Re-tagging of trees is required. Tree marking must be done by certified markers only. Mill run tally should be performed. Harvest scheduled for same time as Parkside Gully Selection (1.10.3).
Activity	1 Active Regular–data set regularly updated and maintained
Quality	2 Good
Stability	1 Very Stable–current format/hard copy/backed up/annotated
Silvicultural treatments	improvement cut; single-tree selection
Measurements	crown class; crown size; logging damage; DBH; quality class; tree number
Map types	custom site map; sketch linked to road traverse; Swan Lake GIS–locations approximate
Establishment year	1966
Measurement years	1966 pre- & post-cut; 1973 pre- & post-cut; 1979 pre- & post-cut; 1989; 1992 pre-cut; 1993
Treatment years	1966; 1973; 1979; 1992-93
Future measurement years	2005 pre-cut; 2006 post-cut; 2020 pre-cut; 2021 post-cut
Scheduled treatment years	2005; 2020

Study sites	Property	Value
Swan Lake Forest Research Reserve	Latitude	45 / 29 / 13
	Longitude	78 / 53 / 45
	Radius	150 m
	Site class	1
	Species	American beech
	Species	sugar maple
	Species	yellow birch
	Type	plot

Data location	Property	Value
OMNR-MNR	Analog formats	paper map(s)
	Digital formats	hardwood archive
	Digital formats	Swan Lake GIS

OFRI–MNR (And.)	Analog formats	original tally sheets
	Analog formats	paper map(s)
	Digital formats	ASCII
	Digital formats	hardwood archive
SSI (North Bay)-MNR	Digital formats	hardwood archive

Publications

Anderson, H.W. 1993. Learning to maintain biodiversity in tolerant hardwood forests. *In* The Role of Parks in Conserving Biodiversity: Proceedings of Provincial Parks Centennial Symposium, Sept. 1993, Dorset, ON. Ont. Min. Nat. Resour., Toronto, ON.

Anderson, H.W., Batchelor, B.D., Corbett, C.M., Deugo, D.T., Husk, C.F., Wilson, W.R. 1990. A silvicultural guide for the tolerant hardwood working group in Ontario. Ont. Min. Nat. Resour., Toronto, ON. Sci. Technol. Ser. Vol. 7. 178 pp.

Anderson, H.W., Rice, J.A. 1993. A tree marking guide for the tolerant hardwoods working group in Ontario. Ont. Min. Nat. Resour., Toronto, ON. Sci. Technol. Ser. Vol. 8. 227 pp.

Anderson, H.W., Rice, J.A. 1990. Swan Lake Forest Research Reserve, Algonquin Provincial Park: general tour guide. Ont. Min. Nat. Resour., Ont. For. Res. Inst., Sault Ste. Marie, ON. Unpubl. Rep. 35 pp.

Bruce, D.S., Heeney, C.J. 1977. A silvicultural guide to the hard maple, yellow birch and hemlock working group in Ontario., Ont. Min. Nat. Resour. Maple, ON. 50 pp.

Ontario Ministry of Natural Resources. 1998. A silvicultural guide for the tolerant hardwood forest in Ontario, Ver. 1.1. Ont. Min. Nat. Resour., Toronto, ON. 500 pp.

1.02.3 Swan Lake marking test plots

Study pseudonyms	Climax forest; Natural uncut forest; Old-growth forest
Study instigator	Harvey Anderson
Associated staff	N/A
Current contact	William Cole
Abstract	The need for sample plots to train MNR tree marking crews was recognized and this site was identified. The plots contain never logged "old-growth" tolerant hardwoods. The site is a drumlinoid landform of deep (20 feet +; 6 m +) moulded silty sand, overlain with 2 to 3 feet (0.6 to 1 m) of ablation moraine of moulded acid silty-sand. The moisture regime is fresh.
Objectives	To serve as a testing area for tree-marking courses (e.g., basal area estimation, identify which trees to leave/cut, etc.). To follow the natural dynamics of undisturbed hardwood forest.
Layout/design	Study consisted of 14 contiguous square plots labelled A to N, each 0.7 acres in area, arranged in a 2 x 7 array, with the longer edge oriented north-south.
Comments	Data used in Benchmark Yield Curve Project (1.23.3).
Activity	2 Active Irregular–data set irregularly updated and maintained
Quality	1 Excellent
Stability	1 Very Stable–current format/hard copy/backed up/annotated
Silvicultural treatments	none
Measurements	crown class; DBH; quality class; soil textures; tree number
Map types	Swan Lake GIS–locations approximate
Establishment year	1965
Measurement years	1965; 1966; 1974; 1976; 1980; 1983; 1989; 1995
Treatment years	none
Future measurement years	2005; 2020
Scheduled treatment years	none

Study sites	Property	Value
Swan Lake Forest Research Reserve	Latitude	45 / 29 / 07
	Longitude	78 / 43 / 36
	Radius	200 m
	Site class	1
	Species	American beech
	Species	sugar maple
	Species	yellow birch
	Type	plot

Data location	Property	Value
OFRI–MNR	Analog formats	paper map(s)
	Digital formats	hardwood archive
	Digital formats	Swan Lake GIS
OFRI–MNR (And.)	Analog formats	original tally sheets
	Digital formats	ASCII
	Digital formats	hardwood archive
SSI (North Bay)-MNR	Digital formats	hardwood archive

Publications

Anderson, H.W. 1993. Learning to maintain biodiversity in tolerant hardwood forests. In The Role of Parks in Conserving Biodiversity: Proceedings of Provincial Parks Centennial Symposium, Sept. 1993, Dorset, ON. Ont. Min. Nat. Resour., Toronto, ON.

Anderson, H.W., Batchelor, B.D., Corbett, C.M., Deugo, D.T., Husk, C.F., Wilson, W.R. 1990. A silvicultural guide for the tolerant hardwood working group in Ontario. Ont. Min. Nat. Resour., Toronto, ON. Sci. Technol. Ser. Vol. 7. 178 pp.

Anderson, H.W., Rice, J.A. 1993. A tree marking guide for the tolerant hardwoods working group in Ontario. Ont. Min. Nat. Resour., Toronto, ON. Sci. Technol. Ser. Vol. 8. 227 pp.

Anderson, H.W., Rice, J.A. 1990. Swan Lake Forest Research Reserve, Algonquin Provincial Park: general tour guide. Ont. Min. Nat. Resour., Ont. For. Res. Inst., Sault Ste. Marie, ON. Unpubl. Rep. 35 pp.

Bruce, D.S., Heeney, C.J. 1977. A silvicultural guide to the hard maple, yellow birch and hemlock working group in Ontario., Ont. Min. Nat. Resour., Maple, ON. 50 pp.

Ontario Ministry of Natural Resources. 1998. A silvicultural guide for the tolerant hardwood forest in Ontario, Ver. 1.1. Ont. Min. Nat. Resour., Toronto, ON. 500 pp.

Ontario Ministry of Natural Resources. Undated. Bracebridge tree markers guide: the early years. Ont. Min. Nat. Resour., Bracebridge, ON. 34 pp.

1.03.3 Swan Lake stand density

Study pseudonyms	Initial stocking levels; stand 72-01; Stand density plots
Study instigator	Mac McLean
Associated staff	Jim Rice; Harvey Anderson
Current contact	William Cole
Abstract	Study was established on a site of average quality (site class 2) to provide growth and development information that would more closely represent expected values for the Algonquin Region. The area's development has been monitored by regular measurement and assessment.
Objectives	To study the growth and quality development of tolerant hardwood forests originating from different levels of stocking.
Layout/design	Area is 8 ha, 39 sample plots ranging from 0.25 acres (0.1 ha) to 0.5 acres (0.2 ha). Plot numbering goes from 1 to 40, but plot 23 does not exist. Study has 6 control plots.
Comments	Data used in Benchmark Yield Curve Project (1.23.3). Re-tagging of trees and relocating posts is required.
Activity	1 Active Regular–data set regularly updated and maintained
Quality	1 Excellent
Stability	1 Very Stable–current format/hard copy/backed up/annotated
Silvicultural treatments	single-tree selection
Measurements	DBH; quality class; soil textures; tree number
Map types	FRI scale 1:15,840; sketch; Swan Lake GIS–locations approximate
Establishment year	1972
Measurement years	1972 pre-cut; 1973 post-cut; 1978; 1984; 1991
Treatment years	1972
Future measurement years	2008 pre-cut; 2009 post-cut
Scheduled treatment years	2008

Study sites	Property	Value
Swan Lake Forest Research Reserve	Latitude	45 / 28 / 38
	Longitude	78 / 43 / 17
	Radius	350 m
	Site class	2
	Species	American beech
	Species	sugar maple
	Species	yellow birch
	Type	plot

Data location	Property	Value
OFRI–MNR	Analog formats	original tally sheets
	Analog formats	paper map(s)
	Digital formats	ASCII
	Digital formats	hardwood archive
	Digital formats	Swan Lake GIS
OFRI–MNR (And.)	Analog formats	original tally sheets
	Digital formats	ASCII
	Digital formats	hardwood archive
SSI (North Bay)-MNR	Digital formats	hardwood archive

Publications

Anderson, H.W. 1993. Learning to maintain biodiversity in tolerant hardwood forests. *In* The Role of Parks in Conserving Biodiversity: Proceedings of Provincial Parks Centennial Symposium, Sept. 1993, Dorset, ON. Ont. Min. Nat. Resour., Toronto, ON.

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McLean, M.M. 1987. Stand growth after thinning 61- to 80-year age-class in tolerant hardwoods. Ont. Min. Nat. Resour., Ont. Tree Improv. For. Biomass Inst., Maple, ON.

McLean, M.M. Undated. Stand growth and development after partial cutting in tolerant hardwoods. Dorset, Ont. Ont. Min. Nat. Resour., Ont. For. Res. Cent., Maple, ON. File Rep. 9 pp.

Ontario Ministry of Natural Resources. 1998. A silvicultural guide for the tolerant hardwood forest in Ontario, Ver. 1.1. Ont. Min. Nat. Resour., Toronto, ON. 500 pp.

1.04.3 Swan Lake photo plots

Study pseudonyms	Dynamics of age and stand structure in the northern tolerant hardwood forest; Parkside Gully photo plots; Scott Lake photo plots
Study instigator	Harvey Anderson
Associated staff	Jim Rice
Current contact	William Cole
Abstract	This photographic study and the accompanying stand data are intended to illustrate stand dynamics (the ongoing changes in structure, stocking, growth and quality) both in disturbed and undisturbed conditions, so that the forest manager may develop a clearer appreciation of the effects of management interventions on future development. The series of 35 mm slide photographs (stored in 5 binders) are used as a visual demonstration of stand dynamics in a tolerant hardwood forest with the plot measurements providing quantitative support.
Objectives	To provide insight into stand structure, growth, and quality changes through time for managed and unmanaged tolerant hardwood stands.
Layout/design	A series of 51 plots (#1- 38 at Parkside Gully, or "6713" due to its proximity to a numbered stand of the same name, and #39 - 51 at Scott Lake, or "Drumlin" due to its location on a drumlin) established in 1975 have been photographed and measured at regular intervals until 1990. Plot sizes range from 0.05-0.4 acres (0.01-0.1 ha).
Comments	Some trees overlap into two plots. Historical slides should be stored digitally. Plot centre should be located with a GPS. Trees within plots should be mapped with polar coordinates (e.g., azimuth).
Activity	2 Active Irregular–data set irregularly updated and maintained
Quality	1 Excellent
Stability	2 Moderately Stable–current format/hard copy
Silvicultural treatments	none
Measurements	basal area; crown class; DBH; quality class; tree number
Map types	Field maps 1:2400; sketch linked to road traverse; Swan Lake GIS–locations approximate; wall maps 1:600
Establishment year	1975
Measurement years	1975; 1976; 1983; 1990
Treatment years	none
Future measurement years	2005; 2015
Scheduled treatment years	none

Study sites	Property	Value
Swan Lake Forest Research Reserve/Parkside	Latitude	45 / 27 / 14
	Longitude	78 / 42 / 30
	Radius	235 m
	Site class	2
	Species	sugar maple
	Type	transect
Swan Lake Forest Research Reserve/ Scott Lake Drumlin	Latitude	45 / 29 / 07
	Longitude	78 / 43 / 36
	Radius	250 m
	Site class	1
	Species	American beech
	Species	sugar maple
	Species	yellow birch
	Type	transect

Data location	Property	Value
OFRI–MNR	Analog formats	35 mm slides
	Analog formats	original tally sheets
	Analog formats	paper map(s)
	Digital formats	Swan Lake GIS

Publications

None

1.05.3 Swan Lake tolerant hardwood stand dynamics

Study pseudonyms	Exclosure north back projection; tolerant hardwood increment dynamics	
Study instigator	Harvey Anderson	
Associated staff	Jim Rice	
Current contact	William Cole	
Abstract	This study used back-projection techniques (for a period of up to 100 years) to gain insight into the dynamics of a tolerant hardwood stand. The natural patterns of growth, replacement, and development were assessed to increase understanding of tolerant hardwood forest development.	
Objectives	To explore the development of an undisturbed tolerant hardwood stand in a late successional stage.	
Layout/design	Original 57 m x 47.5 m (0.27 ha) plot later enlarged to triangular shape bordering on the Yellow Birch Regeneration Dynamics study (2.04.1).	
Comments	Pseudonym "exclosure north" refers to the fact that the study area is north of the large deer exclosure associated with yellow birch regeneration dynamics study. As no treatments were applied this has value as a "natural control."	
Activity	2 Active Irregular–data set irregularly updated and maintained	
Quality	1 Excellent	
Stability	2 Moderately Stable–current format/hard copy	
Silvicultural treatments	none	
Measurements	tree age; basal area; live/dead status; DBH; stem analysis; stem map	
Map types	custom site map; Swan Lake GIS–locations approximate	
Establishment year	1987	
Measurement years	1988; 1989; 1990	
Treatment years	none	
Future measurement years	2004	
Scheduled treatment years	none	
Study sites	**Property**	**Value**
Swan Lake Forest Research Reserve	Latitude	45 / 28 / 51
	Longitude	78 / 43 / 44
	Radius	60 m
	Site class	1
	Species	American beech
	Species	sugar maple
	Species	yellow birch
	Type	plot
Data location	**Property**	**Value**
OFRI–MNR	Digital formats	hardwood archive
OFRI–MNR (And.)	Analog formats	original tally sheets
	Analog formats	paper map(s)
	Digital formats	hardwood archive
SSI (North Bay)-MNR	Digital formats	hardwood archive

Publications

Anderson, H.W. 1993. Learning to maintain biodiversity in tolerant hardwood forests. *In* The Role of Parks in Conserving Biodiversity: Proceedings of Provincial Parks Centennial Symposium, Sept. 1993, Dorset, ON. Ont. Min. Nat. Resour., Toronto, ON.

Anderson, H.W., Batchelor, B.D., Corbett, C.M., Deugo, D.T., Husk, C.F., Wilson, W.R. 1990. A Silvicultural Guide for the Tolerant Hardwood Working Group in Ontario. Ont. Min. Nat. Resour., Toronto, ON. Sci. Technol. Ser. Vol. 7. 178 pp.

Bruce, D.S., Heeney, C.J. 1977. A silvicultural guide to the hard maple, yellow birch, and hemlock working group in Ontario. Ont. Min. Nat. Resour. Maple, ON. 50 pp.

Burton, D.H. 1968. Silviculture and management of maple. Ont. Dept. Lands For., Res. Div., Maple, ON. File Rep. 4 pp.

Ontario Ministry of Natural Resources. 1998. A silvicultural guide for the tolerant hardwood forest in Ontario, Ver. 1.1. Ont. Min. Nat. Resour., Toronto, ON. 500 pp.

Ontario Ministry of Natural Resources. 2000. A silvicultural guide to managing southern Ontario forests, Ver 1.1. Ont. Min. Nat. Resour., Toronto, ON. 648 pp.

1.06.3 Acid rain impact on nutrient availability

Study pseudonyms	Impact of atmospheric deposition on organic matter dynamics and nutrient availability in sugar maple forest ecosystems	
Study instigator	Ian Morrison	
Associated staff	William Cole	
Current contact	Ian Morrison	
Abstract	This study, conducted in a sugar maple stand, measures how low soil pH influences nutrient availability for plant uptake.	
Objectives	To investigate how acid rain may influence nutrient availability.	
Layout/design	This Swan Lake site is 1 of 4 related research sites. At each site, 2 0.04 ha PSPs were established, each PSP has 8 1 x 1 m litter traps.	
Comments		
Activity	5 Unknown	
Quality	5 Unknown	
Stability	5 Unknown	
Silvicultural treatments	none	
Measurements	soil nutrient analysis	
Map types	Swan Lake GIS–locations approximate	
Establishment year	1992	
Measurement years	1993; 1994; 1995	
Treatment years	N/A	
Future measurement years	unknown	
Scheduled treatment years	unknown	
Study sites	**Property**	**Value**
Swan Lake Forest Research Reserve	Latitude	45 / 28 / 44
	Longitude	78 / 43 / 05
	Radius	20 m
	Site class	2
	Species	sugar maple
	Type	plot
Data location	**Property**	**Value**
Great Lakes Forestry Centre–CFS	Analog formats	unknown

Publications

Morrison, I.K. 1990. Addition of organic matter and elements to the forest floor of an old-growth *Acer saccharum* forest in the annual litter fall. Can. J. For. Res. 21: 462-468.

1.07.3 Swan Lake clear length study

Study pseudonyms	Clear length traverse; Sugar maple clear length development	
Study instigator	Harvey Anderson	
Associated staff	Murray Woods	
Current contact	William Cole	
Abstract	Study trees are periodically (5 to 10 years) measured to determine changes in bole characteristics and tree vigour. Increment borings were taken on the centre trees and their major competitors. Crown width/length and position, total height and height to lowest live and dead branch of various sizes were measured.	
Objectives	To study the rate of development of tree bole form (i.e., self-pruning and fork persistence) in polewood sugar maple trees in relation to competitive position and point density.	
Layout/design	Thirty-five sample trees were selected as centre points for these polar plots. All trees were measured and mapped within a 50 foot (15 m) radius. The sample trees were grouped into 2 areas (A, B) 365 m apart.	
Comments	Renumbering of trees is necessary. Due to the gradual nature of the process, this study requires long-term maintenance.	
Activity	3 Inactive Available–data set static/available	
Quality	1 Excellent	
Stability	3 Moderately Unstable–obsolete format/poor hard copy	
Silvicultural treatments	none	
Measurements	tree age; basal area; crown quality; crown size; dieback level; height; quality class; regeneration tally; stem map	
Map types	sketch linked to road traverse; Swan Lake GIS–locations approximate	
Establishment year	1972	
Measurement years	1972; 1977; 1990	
Treatment years	none	
Future measurement years	unknown	
Scheduled treatment years	unknown	
Study sites	**Property**	**Value**
Swan Lake Forest Research Reserve	Latitude	45 / 29 / 15
	Longitude	78 / 43 / 34
	Radius	200 m
	Site class	1
	Species	sugar maple
	Type	polar plot
	Type	transect
Data location	**Property**	**Value**
OFRI–MNR (And.)	Analog formats	paper map(s)
	Digital formats	hardwood archive

Publications

Anderson, H.W. 1983. Individual tree growth and quality potential. Pp. 17-28 *in* Management of Tolerant Hardwoods in Algonquin Provincial Park. Ont. Min. Nat. Resour., For. Manage. Br., Toronto, ON. 72 pp

Anderson, H.W. 1993. Learning to maintain biodiversity in tolerant hardwood forests. *In* The Role of Parks in Conserving Biodiversity: Proceedings of Provincial Parks Centennial Symposium, Sept. 1993, Dorset, ON. Ont. Min. Nat. Resour., Toronto, ON.

1.08.3 Parkside Bay demonstration cutting trial

Study pseudonyms	N/A
Study instigator	Harvey Anderson
Associated staff	Murray Woods
Current contact	William Cole
Abstract	At the request of MNR's Algonquin Region, a demonstration of selection cutting on an average quality site was established. The study was designed with 3 replications to cover variation in the site. The stand was considered to have average acceptable growing stock for tolerant hardwoods and treatments consisted of 3 target basal areas (BA); 40, 60 and 80 sq. ft./ac. (9.2, 13.8, 18.4 m^2/ha) in trees 9.6 inches (24.4 cm) DBH and larger, intended to be managed on a 12- to 15-year cutting cycle. This BA range straddled the normal target of 60 sq. ft./ac. (13.8 m^2/ha) typically managed on a 20-year cutting cycle. Short-log skidding was carried out within the treatment plots and tree-length operations were used between plot clusters and elsewhere.
Objectives	To demonstrate both visually and quantitatively the effect of different selection management strategies on forest values.
Layout/design	Six ha area contains 53 plots, each plot is 0.4 acres (0.16 ha) (and contains 4 x 0.1 acre (0.04 ha) subplots), area was cut to 3 residual stocking levels (replicated design with controls). Based on a preliminary tree quality cruise, treatment blocks were assigned randomly but stratified according to original stocking level.
Comments	Not all intended residual BA was achieved in all plots. Data used in Benchmark Yield Curve Project (1.23.3).
Activity	3 Inactive Available–data set static/available
Quality	2 Good
Stability	1 Very Stable–current format/hard copy/backed up/annotated
Silvicultural treatments	single-tree selection
Measurements	basal area; DBH; height; quality class; tree number
Map types	custom site map; sketch; Swan Lake GIS–locations approximate
Establishment year	1985
Measurement years	1985; 1986; 1989; 1993; 1999
Treatment years	1986
Future measurement years	2008 pre-cut; 2009 post-cut
Scheduled treatment years	2008

Study sites	Property	Value
Swan Lake Forest Research Reserve	Latitude	45 / 28 / 22
	Longitude	78 / 41 / 46
	Radius	450 m
	Site class	2
	Species	sugar maple
	Type	plot

Data location	Property	Value
OFRI–MNR	Analog formats	paper map(s)
	Analog formats	photocopied sheets
	Digital formats	hardwood archive
	Digital formats	Swan Lake GIS
OFRI–MNR (And.)	Digital formats	hardwood archive
SSI (North Bay)-MNR	Digital formats	hardwood archive

Publications

Anderson, H.W. 1993. Learning to maintain biodiversity in tolerant hardwood forests. *In* The Role of Parks in Conserving Biodiversity: Proceedings of Provincial Parks Centennial Symposium, Sept. 1993, Dorset, ON. Ont. Min. Nat. Resour., Toronto, ON.

Anderson, H.W., Batchelor, B.D., Corbett, C.M., Deugo, D.T., Husk, C.F., Wilson, W.R. 1990. A silvicultural guide for the tolerant hardwood working group in Ontario. Ont. Min. Nat. Resour., Toronto, ON. Sci. Technol. Ser. Vol. 7. 178 pp.

Anderson, H.W., Rice, J.A. 1993. A tree marking guide for the tolerant hardwoods working group in Ontario. Ont. Min. Nat. Resour., Toronto, ON. Sci. Technol. Ser. Vol. 8. 227 pp.

Bruce, D.S., Heeney, C.J. 1977. A silvicultural guide to the hard maple, yellow birch, and hemlock working group in Ontario., Ont. Min. Nat. Resour. Maple, ON. 50 pp.

Ontario Ministry of Natural Resources. 1998. A silvicultural guide for the tolerant hardwood forest in Ontario, Ver. 1.1. Ont. Min. Nat. Resour., Toronto, ON. 500 pp.

Ontario Ministry of Natural Resources. 2000. A silvicultural guide to managing southern Ontario forests, Ver 1.1. Ont. Min. Nat. Resour., Toronto, ON. 648 pp.

1.09.3 Parkside Bay hardwood tree crown growth

Study pseudonyms	Parkside Bay
Study instigator	William Cole
Associated staff	Murray Woods
Current contact	William Cole
Abstract	Hardwood tree crown data was collected within the larger Parkside Bay study area. Crown measurements were made for trees within existing Growth and Yield Program plots. Relationships between diameter and crown dimensions were explored.
Objectives	To field test a methodology for measuring hardwood tree crowns. To determine size and growth relationships between diameter and crown size.
Layout/design	Contains 14 plots (40 x 40 m) with 4 subplots; includes unharvested controls.
Comments	
Activity	1 Active Regular–data set regularly updated and maintained
Quality	1 Excellent
Stability	1 Very Stable–current format/hard copy/backed up/annotated
Silvicultural treatments	single-tree selection
Measurements	basal area; crown class; crown length; DBH; exposed crown radius; height; total crown radius; tree number
Map types	sketch; Swan Lake GIS–locations approximate
Establishment year	1993
Measurement years	1993; 1995; 2000
Treatment years	1986
Future measurement years	2008 pre-cut; 2009 post-cut
Scheduled treatment years	2008

Study sites	Property	Value
Swan Lake Forest Research Reserve	Latitude	45 / 28 / 22
	Longitude	78 / 41 / 48
	Radius	350 m
	Site class	1
	Species	sugar maple
	Type	plot

Data location	Property	Value
OFRI–MNR	Analog formats	original tally sheets
	Analog formats	paper map(s)
	Digital formats	MS Access
	Digital formats	CD-ROM
	Digital formats	MS Excel
	Digital formats	Swan Lake GIS
SSI (North Bay)-MNR	Digital formats	MS Access

Publications

Cole, W.G. 1995. Hardwood tree crown measurement guide. Ont. Min. Nat. Resour., Ont. For. Res. Inst., Sault Ste. Marie, ON. 18 pp.

1.10.3 Parkside Gully selection study

Study pseudonyms	Parkside Gully
Study instigator	Harvey Anderson
Associated staff	Murray Woods
Current contact	William Cole
Abstract	The site and stand chosen for study were considered above average for Algonquin Region in terms of tree vigour and quality as well as soil characteristics. When the study was established, intensive management of tolerant hardwoods was being considered only for the "best" sites, so the use of an above average site was warranted. The area had been lightly high-graded for yellow birch around 1930 but was essentially undisturbed. The plots were marked to retain the best growing stock in terms of quality, vigour, and risk, with marking to retain a variety of residual stocking levels (ranging from 40 to 80 sq. ft./ac.; 9.2 to 18.4 m^2/ha).
Objectives	To investigate the growth and structure changes that can be expected after selection cutting in uneven-aged hardwood stands. To determine how stand structure and stocking development are affected by residual stocking.
Layout/design	Contains 3 areas: Parkside Gully 1 (northern most) established in 1967 consists of 25, 1 acre (0.4 ha) square plots. All trees were measured. Area managed on a 12-year cutting cycle using single-tree selection (3 cuts to date). Parkside Gully 2 (southern most) established in 1979, 6 ha replication, has been harvested once in 1980 (same time as the 2nd cut at Parkside Gully 1). Parkside Gully 3 (centre) established in 1967, 8 ha, 15 control plots
Comments	Data used in Benchmark Yield Curve Project (1.23.3). Re-tagging of trees is required. Tree marking should be done by certified markers only. Mill run tally should be performed. Read "Remeasurement Procedure" document prior to conducting measurements. Harvest scheduled for same time as Scott Lake Stand Improvement. Swan Lake strategic plan and Algonquin Park management plan amendment required.
Activity	1 Active Regular–data set regularly updated and maintained
Quality	1 Excellent
Stability	1 Very Stable–current format/hard copy/backed up/annotated
Silvicultural treatments	single-tree selection
Measurements	crown class; crown size; logging damage; live/dead status; DBH; quality class; tree number; volume yields
Map types	sketch linked to road traverse; Swan Lake GIS–locations approximate
Establishment year	1967; 1979
Measurement years	1967; 1968; 1974; 1976; 1978; 1980; 1981; 1984; 1987; 1990; 1992; 1993; 1997
Treatment years	1967; 1980; 1992
Future measurement years	2005 pre-cut; 2006 post-cut; 2020 pre-cut; 2021 post-cut
Scheduled treatment years	2005; 2020

Study sites	Property	Value
Swan Lake Forest Research Reserve	Latitude	45 / 27 / 29
	Longitude	78 / 42 / 41
	Radius	865 m
	Site class	1
	Site class	2
	Species	sugar maple
	Type	plot

Data location	Property	Value
OFRI–MNR	Analog formats	paper map(s)
	Digital formats	hardwood archive
	Digital formats	Swan Lake GIS
OFRI–MNR (And.)	Analog formats	paper map(s)
	Digital formats	3.5" floppy disk
	Digital formats	ASCII
	Digital formats	hardwood archive
SSI (North Bay)-MNR	Digital formats	hardwood archive

Publications

Anderson, H.W. 1983. Recruitment of hard maple. Pp. 50-52 *in* Management of Tolerant Hardwoods in Algonquin Provincial Park. Ont. Min. Nat. Resour., For. Manage. Br., Toronto, ON. 72 pp.

Anderson, H.W. 1983. Silvical characteristics influencing management options. Pp. 8-17 *in* Management of Tolerant Hardwoods in Algonquin Provincial Park. Ont. Min. Nat. Resour., For. Manage. Br., Toronto, ON. 72 pp.

Anderson, H.W. 1993. Learning to maintain biodiversity in tolerant hardwood forests. *In* The Role of Parks in Conserving Biodiversity: Proceedings of Provincial Parks Centennial Symposium, Sept. 1993, Dorset, ON. Ont. Min. Nat. Resour., Toronto, ON.

Anderson, H.W., Batchelor, B.D., Corbett, C.M., Deugo, D.T., Husk, C.F., Wilson, W.R. 1990. A silvicultural guide for the tolerant hardwood working group in Ontario. Ont. Min. Nat. Resour., Toronto, ON. Sci. Technol. Ser. Vol. 7. 178 pp.

Anderson, H.W., Rice, J.A. 1990. Swan Lake Forest Research Reserve, Algonquin Provincial Park: general tour guide. Ont. Min. Nat. Resour., Ont. For. Res. Inst., Sault Ste. Marie, ON. Unpubl. Rep. 35 pp.

Anderson, H.W., Rice, J.A. 1993. A tree marking guide for the tolerant hardwoods working group in Ontario. Ont. Min. Nat. Resour., Toronto, ON. Sci. Technol. Ser. Vol. 8. 227 pp.

Anderson, H.W., Roberts, K.W., Rice, J.A., Beekers, W. 1985. Ecology and silviculture of tolerant hardwoods (poster presentation). In Proc. Can. Ont. Joint For. Res. Comm. Symp., Geneva Park, ON.

Bruce, D.S., Heeney, C.J. 1977. A silvicultural guide to the hard maple, yellow birch, and hemlock working group in Ontario., Ont. Min. Nat. Resour. Maple, ON. 50 pp.

McLean, M.M. 1986. Selection cutting trials. *In* Tour: Swan Lake Forest Research Reserve, OTIFBI scientific review. Ont. Min. Nat. Resour., Ont. Tree Improv. For. Biom. Inst., Maple, ON. 40 pp.

Ontario Ministry of Natural Resources. 1973. Management of tolerant hardwoods in Algonquin Provincial Park. Ont. Min. Nat. Resour., Div. For., For. Manage. Br., Toronto, ON. 84 pp.

Ontario Ministry of Natural Resources. 1998. A silvicultural guide for the tolerant hardwood forest in Ontario, Ver. 1.1. Ont. Min. Nat. Resour., Toronto, ON. 500 pp.

1.11.1 Sugar maple height growth

Study pseudonyms	N/A	
Study instigator	Harvey Anderson	
Associated staff	Jim Rice	
Current contact	William Cole	
Abstract	Seedling and sapling sugar maple growing in a variety of conditions were measured to gain a better understanding of height growth rate and pattern. This study supported the development of stocking/basal area targets.	
Objectives	To describe the current height growth rate of sugar maple of various origins and ages growing under a variety of horizontal and vertical stocking levels. To describe the height growth pattern of sugar maple of various origins, ages, and sizes as related to the degree and time of stand disturbance.	
Layout/design	Seventeen temporary sample plots (polar) were located along the Swan Lake access road.	
Comments	Further studies to verify findings would be helpful. This study built on earlier work conducted at Crozier Lake/Shoe Lake.	
Activity	3 Inactive Available–data set static/available	
Quality	1 Excellent	
Stability	2 Moderately Stable–current format/hard copy	
Silvicultural treatments	harvest cut; none	
Measurements	crown closure (%); tree age; basal area; DBH; height; stem map; stocking; tree number recorded	
Map types	custom site map; sketch	
Establishment year	1972	
Measurement years	1972; 1973	
Treatment years	N/A	
Future measurement years	none scheduled	
Scheduled treatment years	N/A	
Study sites	**Property**	**Value**
Swan Lake Forest Research Reserve	Latitude	45 / 29 / 43
	Longitude	78 / 48 / 40
	Radius	1.2 km
	Site class	2
	Species	sugar maple
	Type	polar plot
Data location	**Property**	**Value**
OFRI–MNR (And.)	Analog formats	original tally sheets
	Digital formats	hardwood archive

Publications

Anderson, H.W. 1983. Recruitment of hard maple. Pp. 50-52 *in* Management of Tolerant Hardwoods in Algonquin Provincial Park. Ont. Min. Nat. Resour., For. Manage. Br., Toronto, ON. 72 pp.

Anderson, H.W., Batchelor, B.D., Corbett, C.M., Deugo, D.T., Husk, C.F., Wilson, W.R. 1990. A silvicultural guide for the tolerant hardwood working group in Ontario. Ont. Min. Nat. Resour., Toronto, ON. Sci. Technol. Ser. Vol. 7. 178 pp.

1.12.3 Corry Lake single-tree selection

Study pseudonyms	Corry Lake woodlot; The woodlot
Study instigator	A.B. Berry
Associated staff	Craig Robinson
Current contact	Steve D'Eon
Abstract	The aim of the original experiment was to evaluate growth response at 2 upper diameter limits (40 and 50 cm), 2 levels of growing stock (140 and 210 m3/ha) and 2 cutting cycles (5 and 10 years). Results suggest that residual volume and upper diameter limit significantly affected the mortality rate and net volume increment, but length of cutting cycle did not. A second study investigated how the early treatments had affected the regeneration. Good regeneration (particularly sugar maple) was achieved under all treatment combinations. Area contains 3 PSPs with data collected since the 1920s. A 1988 windstorm caused considerable damage.
Objectives	To determine growth response and optimum level of growing stock under single tree selection. To evaluate whether the different treatments affected seedling species composition and density.
Layout/design	Total area of tract is 24.3 ha. Eight treatment compartments were established each having a unique combination of (1) residual volume of 140 or 210 m^3/ha, (2) maximum diameter of 40 or 50 cm, and (3) cutting cycle of 5 or 10 years. Second study conducted regeneration surveys in 16 m^2 rectangular plots for seedlings > 1.25 m tall and used 3 randomly located 1 m^2 subplots for seedlings < 1.25 m. No control plots, variable application of treatment (target residual volume and maximum diameter not always achieved).
Comments	Data used in Benchmark Yield Curve Project (1.23.3). Significant variation in site conditions (e.g., moisture regime).
Activity	1 Active Regular–data set regularly updated and maintained
Quality	2 Good
Stability	1 Very Stable–current format/hard copy/backed up/annotated
Silvicultural treatments	single-tree selection
Measurements	DBH; height; quality class; regeneration tally; soil textures; stem map
Map types	custom site map; sketch
Establishment year	1956
Measurement years	1959-65; 1973; 1978; 1983; 1988; 1993; 1998
Treatment years	1936; 1956; 1973; 1978; 1983
Future measurement years	none scheduled
Scheduled treatment years	none scheduled

Study sites	Property	Value
Petawawa Research Forest/Corry Lake Woodlot	Latitude	45 / 58
	Longitude	77 / 31
	Radius	200 m
	Site class	1
	Species	American beech
	Species	basswood
	Species	sugar maple
	Species	yellow birch
	Type	plot

Data location	Property	Value
Petawawa Research Forest	Analog formats	original tally sheets
	Analog formats	paper map(s)
	Digital formats	ASCII
	Digital formats	CD-ROM
	Digital formats	MS Excel
	Digital formats	MS Word

Publications

Bankowski, J., Dey, D.C., Boysen, E.P., Woods, M.E., Rice, J.A. 1996. Validation of NE-TWIGS for tolerant hardwood stands in Ontario. Ont. Min. Nat. Resour., Ont. For. Res. Inst., Sault Ste. Marie, ON. For Res. Inf. Pap. No. 130. 21 pp.

Bankowski, J., Dey, D.C., Woods, M.E., Rice, J.A., Boysen, E.P., Batchelor, B.D., Miller, R.J. 1995. Validation of FIBER 3.0 for tolerant hardwood stands in Ontario. Ont. Min. Nat. Resour., Ont. For. Res. Inst., Sault Ste. Marie, ON. For. Res. Inf. Pap. No. 124. 32 pp.

Bankowski, J., Dey, D.C., Woods, M.E., Rice, J.A., Boysen, E.P., Miller, R.J. 1995. Validation of SILVAH for tolerant hardwoods in Ontario. Ont. Min. Nat. Resour., Ont. For. Res. Inst., Sault Ste. Marie, ON. For. Res. Inf. Pap. No. 128. 28 pp.

Berry, A.B. 1963. Developing an ideal growing stock for tolerant hardwoods in central Ontario. For. Chron. 39(4): 467-476.

Berry, A.B. 1981. A study in single-tree selection for tolerant hardwoods. Can. Dept. Env., Can. For. Serv., Petawawa Nat. For. Inst., Petawawa, ON. Inf. Rep. PI-X-8. 11 pp.

Fraser, D.A. 1957. Annual and seasonal march of soil temperature on several sites under a hardwood stand. Can. Dept. North. Aff. Nat. Resour., For. Br., Ottawa, ON. Tech. Note No. 56. 15 pp.

LaRocque, G. 1985. Regeneration in a tolerant hardwood stand managed under single-tree selection. Can. For. Serv, Petawawa Nat. For. Inst., Petawawa, ON. Inf. Rep. PI-X-50. 16 pp.

Stiell, W.M. 1974. Proceedings: Canadian Forestry Service Hardwoods Management Workshop, Sept. 24-26, 1974, Petawawa, ON. Can. Dept. Env., Can. For. Serv., For. Mgt. Inst., Ottawa, ON. 255 pp.

1.13.1 Sugar maple artificial regeneration

Study pseudonyms	St. Marys	
Study instigator	Fred von Althen	
Associated staff	N/A	
Current Contact	Suzanne Wetzel	
Abstract	A Scots pine plantation was row thinned at different intensities and artificially regenerated using a variety of methods. While manual seeding was shown to be unsuccessful, planting either seedlings or transplants proved very successful based on the 4-year survival rate. Removing 1 of 2 rows or 2 of 3 rows of the Scots pine overstory provided optimal light levels for seedling establishment. Physical protection of the seedlings from browsing is warranted where deer and rabbit populations are high.	
Objectives	To determine an effective method of converting unmerchantable Scots pine plantations to sugar maple.	
Layout/design	Single Scots plantation row thinned and underplanted.	
Comments	Experiment had untreated control areas.	
Activity	5 Unknown	
Quality	5 Unknown	
Stability	5 Unknown	
Silvicultural treatments	planting; seeded manually; site preparation; thinning-rows	
Measurements	crown closure (%); height; regeneration tally	
Map types	custom site map	
Establishment year	1969	
Measurement years	1974	
Treatment years	1969	
Future measurement years	none scheduled	
Scheduled treatment years	none scheduled	
Study sites	**Property**	**Value**
St. Marys	Latitude	43 / 20
	Longitude	81 / 10
	Radius	200 m
	Site class	2
	Species	Scots pine
	Species	sugar maple
	Type	plot
Data location	**Property**	**Value**
Great Lakes Forestry Centre–CFS	Analog formats	original tally sheets
	Analog formats	paper map(s)

Publications

Von Althen, F.W. 1983. Planting and tending recommendations for sugar maple. Can. Dept. Env., Can. For. Serv., Grt. Lks. For. Res. Cent., Sault Ste. Marie, ON. 2 pp.
Von Althen, F.W. 1983. Planting and tending recommendations for sugar maple. Can. Dept. Env., Can. For. Serv., Grt. Lks. For. Res. Cent., Sault Ste. Marie, ON. 2 pp.

1.14.2 Trout Creek thinning

Study pseudonyms	Sausage Lake west; Trout Creek growth and yield
Study instigator	Al Beckwith
Associated staff	Harvey Anderson; Mac McLean; Tom Bryson
Current contact	Murray Woods
Abstract	This sugar maple stand resulted from clearcutting for the production of charcoal. In 1968, a crop tree selection and release treatment was applied in which all non-crop trees were cut resulting in a variety of stand density conditions. The following summer, plots were established throughout the stand to evaluate the effect of residual basal area on stand growth, structure, and tree quality development.
Objectives	To measure the increase in hardwood tree growth of good quality stems following an improvement cut at a variety of residual basal areas. To determine if quality is adversely affected or bole merchantable length decreased by thinning in 60-year-old stands.
Layout/design	Thirty-three circular 0.1 acre (0.04 ha) plots numbered 28-60; 2 ha area
Comments	Data used in Provincial growth and yield program. Data valuable at the stand level. Study located off of Ralph's Road. Data used in Benchmark Yield Curve Project (1.23.3).
Activity	1 Active Regular–data set regularly updated and maintained
Quality	2 Good
Stability	1 Very Stable–current format/hard copy/backed up/annotated
Silvicultural treatments	improvement cut
Measurements	crown class; DBH; quality class; stem map
Map types	aerial photograph; custom site map; plot map; sketch
Establishment year	1968
Measurement years	1968; 1969; 1974; 1979; 1983; 1989; 1991
Treatment years	1968; 1991
Future measurement years	none scheduled
Scheduled treatment years	none scheduled

Study sites	Property	Value
Laurier township, Conc.13, Lots 18 & 19	Species	sugar maple
	Type	polar plot
Data location	**Property**	**Value**
OFRI–MNR (And.)	Analog formats	photocopied sheets
	Digital formats	Hardwood archive
SSI (North Bay)-MNR	Analog formats	aerial photographs
	Analog formats	paper map(s)
	Analog formats	photocopied sheets
	Digital formats	CD-ROM
	Digital formats	hardwood archive

Publications

Anderson, H.W. 1993. Learning to maintain biodiversity in tolerant hardwood forests. *In* The Role of Parks in Conserving Biodiversity: Proceedings of Provincial Parks Centennial Symposium, Sept. 1993, Dorset, ON. Ont. Min. Nat. Resour., Toronto, ON.

Anderson, H.W., Batchelor, B.D., Corbett, C.M., Deugo, D.T., Husk, C.F., Wilson, W.R. 1990. A silvicultural guide for the tolerant hardwood working group in Ontario. Ont. Min. Nat. Resour., Toronto, ON. Sci. Technol. Ser. Vol. 7. 178 pp.

Anderson, H.W., Rice, J.A. 1993. A tree marking guide for the tolerant hardwoods working group in Ontario. Ont. Min. Nat. Resour., Toronto, ON. Sci. Technol. Ser. Vol. 8. 227 pp.

Bruce, D.S., Heeney, C.J. 1977. A silvicultural guide to the hard maple, yellow birch, and hemlock working group in Ontario., Ont. Min. Nat. Resour. Maple, ON. 50 pp.

Ontario Ministry of Natural Resources. 1998. A silvicultural guide for the tolerant hardwood forest in Ontario, Ver. 1.1. Ont. Min. Nat. Resour., Toronto, ON. 500 pp.

Ontario Ministry of Natural Resources. 2000. A silvicultural guide to managing southern Ontario forests, Ver. 1.1. Ont. Min. Nat. Resour., Toronto, ON. 648 pp.

1.15.2 Crop tree thinning

Study pseudonyms	Algonquin Park ; Lakewoods Timber Ltd Licence D-1498; Little McCauley Lake north; Project PE 256-60
Study instigator	Harvey Anderson
Associated staff	N/A
Current contact	Murray Woods
Abstract	Sugar maple stand originated following a fire in 1910 that killed all but some of the largest trees. Subsequent natural regeneration produced an even-aged maple stand amongst fire-scarred veteran trees. In 1961, an improvement cut was carried out, eliminating defective or poorly-formed trees in order to release the crop-quality polewood. Smaller trees were felled and larger trees were girdled. Selected trees within each of the two areas were destructively sampled in 1965 and stem analyses performed to provide a record of previous growth for different size classes. This allowed a back-projection estimate of the 1961 post-cut stand conditions to be made.
Objectives	To study the effects of the improvement cut on stand growth and quality development.
Layout/design	Ten circular 0.2 acre (0.08 ha) plots were established in both thinned and untreated areas (total area 1.2 ha), not randomized (control plots outside of treated area), and no pre-treatment measurements.
Comments	Study is included on hardwood archive CD-ROM, identified as "LmI." Data used in Benchmark Yield Curve Project (1.23.3).
Activity	2 Active Irregular–data set irregularly updated and maintained
Quality	2 Good
Stability	1 Very Stable–current format/hard copy/backed up/annotated
Silvicultural treatments	girdling; improvement cut
Measurements	basal area; DBH; height; quality class; stem analysis
Map types	district map; sketch
Establishment year	1965
Measurement years	1965; 1969; 1976; 1983; 1989
Treatment years	1961
Future measurement years	none scheduled
Scheduled treatment years	none scheduled

Study sites	Property	Value
Sproule township, Conc 3-4, Lot 35-36	Latitude	45 / 36
	Longitude	78 / 16
	Radius	900 m
	Site class	2
	Species	sugar maple
	Species	yellow birch
	Type	plot

Data location	Property	Value
OFRI–MNR	Digital formats	hardwood archive
OFRI–MNR (And.)	Digital formats	ASCII
	Digital formats	hardwood archive
SSI (North Bay)-MNR	Analog formats	computer printouts
	Analog formats	paper map(s)
	Digital formats	CD-ROM
	Digital formats	hardwood archive

Publications

Anderson, H.W. 1993. Learning to maintain biodiversity in tolerant hardwood forests. *In* The Role of Parks in Conserving Biodiversity: Proceedings of Provincial Parks Centennial Symposium, Sept. 1993, Dorset, ON. Ont. Min. Nat. Resour., Toronto, ON.

1.16.3 Sugar maple forest health

Study pseudonyms	Cambridge Forest health; Cambridge Forest thinning, fertilization and decline; Waterloo Regional Forest, Hofstettter Lake Tract, Compartment 15
Study instigator	Dave McLaughlin
Associated staff	Jim Rice; Harvey Anderson
Current contact	Jim Rice
Abstract	Experimental plots were established in a 4 ha stand of healthy hardwoods to study the effect of fertilization on basal area growth and to study forest decline. In 1989, MOE used a polar plot and recorded dieback indices only. In 1995, the study was expanded to include DBH and species. Although attempts were made to match the 1989 and 1995 tree numbering systems, it is recommended that data be used at the plot level only.
Objectives	To determine the effect of thinning intensity and fertilization on the health of a tolerant hardwood stand in southern Ontario. To determine whether cultural practices (thinning and fertilization) can promote stand health sufficiently to offset the negative effects of acid precipitation.
Layout/design	An unbalanced randomized split-plot design 5 main plots, comprising 3 residual basal area targets (2 replications of "normal" 18 m^2/ha, 2 of a "conservative" 23 m^2/ha and 1 uncut "control" 27 m^2/ha). Major plots were 50 x 100 m, split to form 50 x 50 m subplots). Prescribed fertilizer levels were applied randomly to a 40 x 40 m fertility plot in one subplot of each pair. A 30 m radius circular polar-plot was established in the centre of each subplot for intensive measurement of tree response. A surrounding buffer was thinned to 23 m^2/ha.
Comments	
Activity	2 Active Irregular–data set irregularly updated and maintained
Quality	1 Excellent
Stability	1 Very Stable–current format/hard copy/backed up/annotated
Silvicultural treatments	fertilization; thinning
Measurements	basal area; crown quality; live/dead status; DBH; dieback level; foliage; insect and disease conditions; quality class; soil nutrient analysis; soil textures; stem map
Map types	custom site map; plot map; sketch
Establishment year	1989
Measurement years	1989; 1995
Treatment years	1990
Future measurement years	none scheduled
Scheduled treatment years	none scheduled

Study sites	Property	Value
Wilmot township, Con. S.S.R, Lots 7-10	Latitude	43 / 20
	Longitude	81 / 20
	Radius	150 m
	Site class	1
	Species	American beech
	Species	black cherry
	Species	sugar maple
	Species	white ash
	Type	plot

Data location	Property	Value
OFRI-MNR	Analog formats	computer printouts
	Digital formats	hardwood archive
OFRI-MNR (And.)	Analog formats	computer printouts
	Analog formats	paper map(s)
	Digital formats	hardwood archive
SSI (North Bay)-MNR	Digital formats	hardwood archive

Publications

None

1.17.3 Algonquin regional growth study (ARGS)

Study pseudonyms	Algonquin Region tolerant hardwood growth study; Anstruther township; ARGS, Ballentyne township; Dickson township; East Mills township; Freeman township; Hunter township; McClintock township; Nightingale township; Oakley township
Study instigator	Mac McLean
Associated staff	Jim Rice; Harvey Anderson; Frank Raymond
Current contact	Murray Woods
Abstract	A long-term network of growth and yields plots in tolerant hardwood stands was established in 13 townships across the western and central portions of the Algonquin Region. Stands that had been harvested 6-20 years prior, were dominated by sugar maple, and were average or better than average quality were selected. When established, mensurational, site, and tree location data were collected. Regular monitoring of stands followed, along with the development of a growth model. Since the study was meant to be dynamic, selected plots were harvested under a partial cut system during the winter of 1989-90.
Objectives	To determine how site, stocking, structure, and spatial distribution affect tree growth at both the tree and stand levels. To develop a model to predict growth in tolerant hardwood stands.
Layout/design	Includes 268 square 0.04 ha plots (including controls), to which 95 plots of a companion series of in-growth and mortality plots were added, bringing the total ARGS plots to 359 (some were lost).
Comments	Plots incorporated into provincial growth and yield program plot network. Data used in Benchmark Yield Curve Project (1.23.3).
Activity	1 Active Regular–data set regularly updated and maintained
Quality	1 Excellent
Stability	1 Very Stable–current format/hard copy/backed up/annotated
Silvicultural treatments	single-tree selection
Measurements	tree age; basal area; crown class; crown size; DBH; height; quality class; soil moisture; soil
Map types	custom site map; district map; plot map
Establishment year	1977
Measurement years	1977; 1982; 1987; 1989; 1994
Treatment years	1989
Future measurement years	2005 pre-cut; 2006 post-cut; 2020 pre-cut; 2021 post-cut
Scheduled treatment years	for subset of plots, 2005, 2020

Study sites	Property	Value
Algonquin Region	Latitude	45 / 20
	Longitude	79 / 00
	Radius	75 km
	Site class	1
	Site class	2
	Species	sugar maple
	Type	general
Swan Lake Forest Research Reserve	Latitude	45 / 29 / 07
	Longitude	78 / 44
	Radius	500 m
	Site class	1
	Species	American beech
	Species	eastern hemlock
	Species	sugar maple
	Type	plot

Data location	Property	Value
SSI (North Bay)-MNR	Analog formats	computer printouts
	Analog formats	original tally sheets
	Analog formats	paper map(s)
	Analog formats	photocopied sheets
	Digital formats	FoxPro
	Digital formats	hardwood archive

Publications

Bankowski, J., Dey, D.C., Boysen, E.P., Woods, M.E., Rice, J.A. 1996. Validation of NE-TWIGS for tolerant hardwood stands in Ontario. Ont. Min. Nat. Resour., Ont. For. Res. Inst., Sault Ste. Marie, ON. For Res. Inf. Pap. No. 130. 21 pp.

Bankowski, J., Dey, D.C., Woods, M.E., Rice, J.A., Boysen, E.P., Batchelor, B.D., Miller, R.J. 1995. Validation of FIBER 3.0 for tolerant hardwood stands in Ontario. Ont. Min. Nat. Resour., Ont. For. Res. Inst., Sault Ste. Marie, ON. For. Res. Inf. Pap. No. 124. 32 pp.

Bankowski, J., Dey, D.C., Woods, M.E., Rice, J.A., Boysen, E.P., Miller, R.J. 1995. Validation of SILVAH for tolerant hardwoods in Ontario. Ont. Min. Nat. Resour., Ont. For. Res. Inst., Sault Ste. Marie, ON. For. Res. Inf. Pap. No. 128. 28 pp.

Merchant, B.G. 1988. The effect of soil-site factors on the growth of sugar maple (*Acer saccharum* Marsh.) in the Algonquin region of central Ontario. Univ. Guelph, Dept. Environ. Biol., Guelph, ON. M.Sc. Thesis. 121 pp.

Ontario Ministry of Natural Resources. 1992. Hardwood Program. Pp. 7-9 *in* Central Region Science and Technology Development Unit: annual report 1991-92. Ont. Min. Nat. Resour., Cent. Ont. For. Technol. Devel. Unit, North Bay, ON. 17 pp.

Ontario Ministry of Natural Resources. 1993. Hardwood Program. *In* Central Region Science and Technology Development Unit: annual report 1992-1993. Ont. Min. Nat. Resour., Cent. Ont. Sci. Technol. Devel. Unit, North Bay, ON. 28 pp.

Ontario Ministry of Natural Resources. 1994. Hardwood. Pp. 4-7 *in* Central Region Science and Technology, North Bay: annual report 1993-1994. Ont. Min. Nat. Resour., Cent. Reg. Sci. Technol. Devel. Unit, North Bay, ON. 25 pp.

Raymond, F.L., McLean, M.M. 1984. Simulation of growth and yield of hard maple. Ont. Min. Nat. Resour., Timber Sales Br., Toronto, ON. 36 pp.

1.18.3 Algonquin polar plots

Study pseudonyms	Algonquin Park silvicultural polar plots; APP
Study instigator	Mac McLean
Associated staff	Jim Rice; Harvey Anderson; Carl Corbett
Current contact	Murray Woods
Abstract	This network of plots in Algonquin Park was established in managed stands following tree marking activities but prior to operational harvesting. Plots were located by Algonquin Park District staff following direction provided by Ontario Forest Research Institute staff. All trees in the plots were mapped, measured, and the adequacy of individual tree-marking decisions determined prior to harvest. Following partial cutting, logging damage, conformity of cut to marking configuration, and degree of stemwood utilization, were tallied in each plot. In 1991, data/remeasurement responsibilities were transferred to the provincial growth and yield program.
Objectives	To implement a quality assurance process in Algonquin Park with respect to tree-marking operations in stands for which partial cutting (selection or shelterwood) was prescribed. To assess logging damage, conformity of harvest to prescription, and utilization. To monitor growth and yield resulting from such silvicultural treatments.
Layout/design	374 circular 0.1 acre (0.04 ha) polar plots including 56 controls. Of these, 346 are located in hard maple/beech/yellow birch cover types and 15 are in white pine.
Comments	Plots incorporated into provincial growth and yield program plot network. Data used in Benchmark Yield Curve Project (1.23.3).
Activity	1 Active Regular–data set regularly updated and maintained
Quality	1 Excellent
Stability	1 Very Stable–current format/hard copy/backed up/annotated
Silvicultural treatments	group selection; shelterwood; single-tree selection
Measurements	crown class; logging damage; DBH; height; quality class; soil moisture; soil textures; stem map
Map types	custom site map; plot map
Establishment year	1986
Measurement years	1986; 1991
Treatment years	1986; 1987
Future measurement years	none scheduled
Scheduled treatment years	none scheduled

Study sites	Property	Value
Algonquin Park	Latitude	45 / 50
	Longitude	78 / 20
	Radius	50 km
	Site class	1
	Site class	2
	Site class	3
	Species	American beech
	Species	eastern white pine
	Species	sugar maple
	Species	yellow birch
	Type	general
	Type	polar plot

Data location	Property	Value
OFRI–MNR	Digital formats	hardwood archive
SSI (North Bay)-MNR	Analog formats	computer printouts
	Analog formats	original tally sheets
	Analog formats	paper map(s)
	Digital formats	FoxPro
	Digital formats	hardwood archive

Publications

Anderson, H.W., Rice, J.A. 1996. Quality assurance in hardwood tree marking: a case study. Ont. Min. Nat. Resour., Ont. For. Res. Inst., Sault Ste. Marie, ON. For. Res. Rep. No. 141. 14 pp.

Bankowski, J., Dey, D.C., Boysen, E.P., Woods, M.E., Rice, J.A. 1996. Validation of NE-TWIGS for tolerant hardwood stands in Ontario. Ont. Min. Nat. Resour., Ont. For. Res. Inst., Sault Ste. Marie, ON. For Res. Inf. Pap. No. 130. 21 pp.

Bankowski, J., Dey, D.C., Woods, M.E., Rice, J.A., Boysen, E.P., Batchelor, B.D., Miller, R.J. 1995. Validation of FIBER 3.0 for tolerant hardwood stands in Ontario. Ont. Min. Nat. Resour., Ont. For. Res. Inst., Sault Ste. Marie, ON. For. Res. Inf. Pap. No. 124. 32 pp.

Bankowski, J., Dey, D.C., Woods, M.E., Rice, J.A., Boysen, E.P., Miller, R.J. 1995. Validation of SILVAH for tolerant hardwoods in Ontario. Ont. Min. Nat. Resour., Ont. For. Res. Inst., Sault Ste. Marie, ON. For. Res. Inf. Pap. No. 128. 28 pp.

1.19.3 Beckwith growth and yield plots

Study pseudonyms	ARDA plots; Beckwith research plots; Hardwood yield sample plots
Study instigator	Al Beckwith
Associated staff	N/A
Current contact	Murray Woods
Abstract	This historical network of plots, located across south and central Ontario, provided some of the earliest estimates of growth and yield information for tolerant hardwood stands. These plots were the basis for determining the relationship between soil characteristics and timber quality. Data from this study have been used to independently validate and calibrate models.
Objectives	To provide and interpret basic information relating to hardwood yield and the economics of its production. To determine hardwood yield capability on upland sites in southern Ontario.
Layout/design	Of the original 175 plots, 33 are in Central Region. Plot sizes varied from 0.05 to 0.2 acres (0.02 to 0.08 ha).
Comments	Originally established in red pine plantations in 1949; data used in Benchmark Yield Curve Project (1.23.3).
Activity	3 Inactive Available–data set static/available
Quality	1 Excellent
Stability	1 Very Stable–current format/hard copy/backed up/annotated
Silvicultural treatments	none
Measurements	tree age; live/dead status; DBH; height; stem analysis; stem map
Map types	custom site map; FRI scale 1:15,840; sketch
Establishment year	1952; 1968;
Measurement years	1952; 1962; 1967; 1968; 1969; 1970; 1972
Treatment years	none
Future measurement years	none scheduled
Scheduled treatment years	none scheduled

Study sites	Property	Value
Southern Ontario	Latitude	44 / 30
	Longitude	79 / 00
	Radius	325 km
	Site class	1
	Site class	2
	Site class	3
	Species	sugar maple
	Type	general
	Type	plot

Data location	Property	Value
SSI (North Bay)-MNR	Analog formats	computer printouts
	Analog formats	paper map(s)
	Analog formats	photocopied sheets
	Digital formats	CD-ROM
	Digital formats	FoxPro

Publications

Beckwith, A.F. 1973. Hardwood program of the Mensuration Unit, Forest Research Branch, Ontario Ministry of Natural Resources. Pp. 53-57 *in* Management of Southwestern Ontario Hardwoods: Proc. Can. Ont. Joint For. Res. Comm. Symp., April 1973, Richmond Hill, ON. Dept. Env., Can. For. Serv., Grt. Lks. For. Res. Cent., Sault Ste. Marie, ON. Symp. Proc. O-P-1. 126 pp.

Love, D.V., Beckwith, A.F., Morawski, Z.L.R. 1972. Studies of land productivity for hardwoods in southern Ontario. Canada Land Inventory Program, ARDA, Toronto, ON. Rep. No. 6. 139 pp.

1.20.3 Carleton Place remeasurement of Beckwith plots

Study pseudonyms	ARDA remeasurement; Lanark County	
Study instigator	Al Beckwith	
Associated staff	Martin Streit	
Current contact	Murray Woods	
Abstract	In 1991, Carleton Place District initiated a project to relocate and remeasure 3 of the original Beckwith permanent sample plots. However, individual tree numbers could not be identified for retagging. Although recent growth cannot be determined for individual trees, stand-level data are available.	
Objectives	To determine basal area and volume growth response in treated and untreated stands.	
Layout/design	Lavant township has 2 plots (1 treated and 1 control plot); Dalhousie township has 1 treated plot.	
Comments		
Activity	2 Active Irregular–data set irregularly updated and maintained	
Quality	2 Good	
Stability	2 Moderately Stable–current format/hard copy	
Silvicultural treatments	single-tree selection	
Measurements	tree age; basal area; DBH; height; regeneration tally; stocking; tree number	
Map types	OBM; plot map	
Establishment year	1952	
Measurement years	1952; 1962; 1967; 1972; 1991	
Treatment years		
Future measurement years	none scheduled	
Scheduled treatment years	none scheduled	
Study sites	**Property**	**Value**
Dalhousie township	Latitude	45 / 00
	Longitude	76 / 40
	Radius	15 m
	Site class	2
	Species	basswood
	Species	sugar maple
	Type	plot
Lavant township	Latitude	45 / 05
	Longitude	76 / 43
	Radius	80 m
	Site class	2
	Species	basswood
	Species	northern red oak
	Species	sugar maple
	Type	plot
Data location	**Property**	**Value**
OFRI–MNR	Analog formats	photocopied sheets
SSI (North Bay)-MNR	Analog formats	original tally sheets
	Analog formats	paper map(s)
	Analog formats	photocopied sheets

Publications

None

1.21.3 Bancroft District permanent sample plots (PSPs)

Study pseudonyms	Bancroft District	
Study instigator	Bruce Fleck	
Associated staff	N/A	
Current contact	Murray Woods	
Abstract	In the early 1980s, Bancroft District established its own set of growth and yield plots. These data are now housed at the Southern Science and Information Unit and have been used to enhance the provincial growth and yield network.	
Objectives	To generate tree growth and yield information for individual tolerant hardwood trees and stands.	
Layout/design	Four growth and yield plots were established in tolerant hardwood stands (numbers 3, 4, 5, 6); there are 7 plots in total (3 in other forest types).	
Comments		
Activity	2 Active Irregular–data set irregularly updated and maintained	
Quality	2 Good	
Stability	2 Moderately Stable–current format/hard copy	
Silvicultural treatments		
Measurements	tree age; crown class; DBH; height; stem map	
Map types	district map; plot map	
Establishment year	1983	
Measurement years	1985; 1989; 1999	
Treatment years	none	
Future measurement years	none scheduled	
Scheduled treatment years	none scheduled	
Study sites	**Property**	**Value**
Cashel township #5	Radius	50 m x 80 m
	Species	sugar maple
	Type	plot
Herschel township #6	Radius	50 m x 80 m
	Species	sugar maple
	Type	plot
McClure township #3, 4	Radius	50 m x 80 m
	Species	sugar maple
	Type	plot
Data location	**Property**	**Value**
Bancroft District–MNR	Analog formats	paper map(s)
SSI (North Bay)-MNR	Analog formats	original tally sheets
	Analog formats	paper map(s)
	Digital formats	FoxPro

Publications

None

1.22.3 Domtar permanent sample plot

Study pseudonyms	Former Plonski Property; Stand 6412 and 6209	
Study instigator	W.L. Plonski	
Associated staff	Rob Spence	
Current contact	Scott Brown	
Abstract	This parcel of private land has not been harvested in approximately 55 years.	
Objectives	To assess the stand using the USDA's SILVAH program. To manage under the single-tree selection silvicultural system.	
Layout/design	Four ha area.	
Comments	Formerly owned by W.L. Plonski.	
Activity	2 Active Irregular–data set irregularly updated and maintained	
Quality	2 Good	
Stability	2 Moderately Stable–current format/hard copy	
Silvicultural treatments		
Measurements	basal area; DBH; height; quality class; regeneration tally; stocking	
Map types	district map	
Establishment year		
Measurement years	1996	
Treatment years		
Future measurement years	none scheduled	
Scheduled treatment years	none scheduled	
Study sites	Property	Value
Huntington township, Conc 8, Lot 12	Radius	110 m
	Site class	2
	Species	basswood
	Species	northern red oak
	Species	sugar maple
	Type	operational assessment
Data location	Property	Value
Domtar–Trenton	Analog formats	original tally sheets
	Analog formats	paper map(s)

Publications

None

1.23.3 Benchmark yield curves

Study pseudonyms	Forestry Research Partnership Project #130-009
Study instigator	Murray Woods
Associated staff	Margaret Penner; Al Stinson
Current contact	Murray Woods
Abstract	The project involved analysis of many data sets from field studies. Data sources for the hardwood selection growth rates were derived from: Algonquin Region Growth Study, Algonquin Polar plots, Parkside Bay, Parkside Gully, Louisa Flats, Swan Lake Marking plots, Swan Lake Density plots, Corry Lake, Maunsel Lake, FEC, G&Y, Herschel township and Stokes plots. Studies yielding data for the hardwood uniform shelterwood rates were: Algonquin polar plots, Beckwith, Forest Ecosystem Classification, Growth and Yield PSPs, McCauley Lake and Trout Creek. Growth rates were derived for 13 standard forest units including: hardwood selection (HD1) and hardwood uniform shelterwood (HDUS). These hardwood units comprise sugar maple, yellow birch, red oak, hemlock and other mid-tolerant species. Data compilation considerations were: minimum 10 cm DBH, plots in same stand and treatment were combined, Zakrzewski's taper model was applied, forest units were assigned manually, quality was available for much of the data set, merchantable volume used minimum crown standards and data were weighted by plot size and measurement length.
Objectives	To provide statistically defensible growth curves to analyze wood supply: for Tembec's operating area, for standard forest units, compatible with SFMM, compatible with the inventory, and for various management intensities.
Layout/design	Growth rates were generated based on basal area using potential predictors of quality, shade tolerance, stand structure, and site characteristics. Stand improvement and logging damage variables are added by the user.
Comments	Details available on "Logging Damage/Yield Curve Workshop", CEC, Feb.3, 2003 CD-ROM
Activity	1 Active Regular–data set regularly updated and maintained
Quality	1 Excellent
Stability	1 Very Stable–current format/hard copy/backed up/annotated
Silvicultural treatments	N/A
Measurements	N/A
Map types	N/A
Establishment year	N/A
Measurement years	N/A
Treatment years	N/A
Future measurement years	N/A
Scheduled treatment years	N/A

Data location	Property	Value
SSI (North Bay)-MNR	Digital formats	CD-ROM

Publications

Penner, M. 2003. Development of empirical yield curves for the HD1 Standard Forest Unit. Research Report RP-012. Forestry Research Partnership, Mattawa, ON. 18 pp.

1.24.2 Growth response following partial cutting

Study pseudonyms	Dorset; Haliburton County; Orley Lake; University of Toronto forest; Woodlot 8
Study instigator	David Love
Associated staff	William J. Ondro
Current contact	Murray Woods
Abstract	Three types of partial cutting (light improvement, improvement, and commercial) were applied to remove approximately 20% of the basal area. The cuttings result in different average diameter growths of sugar maple, beech, and yellow birch. A cutting cycle of 8 to 12 years was recommended, along with reducing the basal area to 80 sq. ft./acre (18.4 m^2/ha) in trees from 4 to 24 inches (10.2 to 61.0 cm) DBH after cutting. If cutting intensity is increased, defective, overmature, and poorly formed trees should be targeted to maximize diameter growth of remaining stems.
Objectives	To investigate the relationship between intensity of improvement cutting and associated change in growth and quality.
Layout/design	
Comments	
Activity	4 Inactive Unavailable--data wholly or partially lost
Quality	2 Good
Stability	3 Moderately Unstable--obsolete format/poor hard copy
Silvicultural treatments	group selection; harvest cut; single-tree selection
Measurements	crown class; live/dead status; DBH; quality class; tree number
Map types	district map
Establishment year	1962
Measurement years	1962; 1972
Treatment years	1963
Future measurement years	none scheduled
Scheduled treatment years	none scheduled

Study sites	Property	Value
Sherborne township, Conc. 12, Lots 7 & 8	Latitude	45 / 15
	Longitude	78 / 50
	Radius	875 m
	Site class	2
	Species	American beech
	Species	sugar maple
	Species	yellow birch
	Type	transect

Data location	Property	Value
SSI (North Bay)-MNR	Analog formats	computer printouts
	Analog formats	original tally sheets
	Analog formats	paper map(s)

Publications

Ondro, W.J. 1973. A comparison of the effects of cutting methods on the growth, yield and structure of northern tolerant hardwoods. Univ. Toronto, Forestry Dept., Toronto, ON. M.Sc.F. Thesis. 105 pp.

1.25.3 A sugar maple growth model

Study pseudonyms	MAPLE1
Study instigator	Robert J. Miller
Associated staff	N/A
Current contact	Murray Woods
Abstract	Although this project did not involve collecting field data specifically, it did evaluate data from 258 hardwood PSPs. A final 46 PSPs were selected that met the criteria of being at least 80% stocked to sugar maple, had a minimum of 2 previous measurement cycles and were unmanaged. The 159 associated measurements were used to calculate standard mensurational data to develop this computer-based diameter distribution growth model.
Objectives	To provide more accurate projections of growth and yield for sugar maple stands.
Layout/design	Measurements were used to derive stem frequency by diameter classes, quadratic mean diameter, total basal area, average stand height, dominant stand height, and gross total volume.
Comments	
Activity	1 Active Regular–data set regularly updated and maintained
Quality	2 Good
Stability	2 Moderately Stable–current format/hard copy
Silvicultural treatments	N/A
Measurements	
Map types	N/A
Establishment year	N/A
Measurement years	N/A
Treatment years	N/A
Future measurement years	N/A
Scheduled treatment years	N/A

Study sites	Property	Value
Southcentral Ontario	Latitude	44 / 15
	Longitude	78 / 45
	Radius	230 km
	Site class	1
	Site class	2
	Species	sugar maple
	Type	general

Data location	Property	Value
SSI (North Bay)-MNR	Digital formats	CD-ROM

Publications

Woods, M.E., Miller, R.J. 1989. Maple 1: A sugar maple growth model, user's manual. Ont. Min. Nat. Resour., For. Manage. Br., Mens. Unit, Sault Ste. Marie, ON. 25 pp.

1.26.3 Silvicultural calibration of Algoma/North Shore stands (SCANSS)

Study pseudonyms	Algoma ; Archibald township; Brule township; Gaudette township; Hodgins township; Nicolet township; North Shore; Palmer township; Sault Ste. Marie District; SCANSS; Smilsky township; Wishart township
Study instigator	Jim Rice
Associated staff	Murray Woods; Brian Batchelor
Current contact	Murray Woods
Abstract	While regional stocking and structural guidelines for the selection system have existed in central Ontario for some time, a modified set of guidelines recognizing different soils, climate, and cutting history in the Algoma/North Shore forests was warranted. Back projection techniques were used to determine tree and plot growth responses. A tentative stocking recommendation was 18 m^2/ha residual basal area in trees greater than 10 cm DBH.
Objectives	To develop suitable prescriptions for tolerant hardwood stands in the Algoma/North Shore area to provide a sustainable basis for high quality timber production and ecosystem integrity by means of: (a) conducting surveys to determine the relationship between residual stocking levels and subsequent growth in basal area and volume in hardwood stands disturbed by logging throughout the North Shore area, and comparing such correlations with those on which prescriptions are based in the former Algonquin Region; (b) establishing and monitoring a series of silvicultural trials of partial cutting systems (selection and uniform shelterwood) in hardwood stands on the North Shore area, based on the results of such surveys, to evaluate the appropriateness of such prescriptions; (c) providing growth and yield data from stands managed under appropriate silvicultural systems; (d) affording a visual demonstration of the various treatment methods and levels to allow practitioners to appreciate the differences.
Layout/design	Study consists of 47 randomly located 0.04 ha circular plots showing evidence of past logging activities established in 17 stands. Both plots specifically laid out for the SCANSS project and growth and yield program plots were included.
Comments	Would be beneficial to verify results through cutting trials.
Activity	2 Active Irregular–data set irregularly updated and maintained
Quality	1 Excellent
Stability	2 Moderately Stable–current format/hard copy
Silvicultural treatments	harvest cut
Measurements	tree age; basal area; crown class; live/dead status; DBH; quality class; soil moisture; soil textures; stem map
Map types	custom site map; district map
Establishment year	1994
Measurement years	1994; 1995
Treatment years	
Future measurement years	none scheduled
Scheduled treatment years	none scheduled

Study sites	Property	Value
Algoma/North Shore–8 townships	Latitude	47 / 00
	Longitude	83 / 15
	Radius	100 km
	Site class	1
	Site class	2
	Site class	3
	Species	sugar maple
	Type	general
	Type	plot
Data location	**Property**	**Value**
OFRI–MNR	Analog formats	original tally sheets
	Analog formats	paper map(s)
SSI (North Bay)-MNR	Analog formats	paper map(s)
	Analog formats	photocopied sheets

Publications

Ontario Ministry of Natural Resources. 1994. Hardwood. Pp. 4-7 *in* Central Region Science and Technology, North Bay: annual report 1993-1994. Ont. Min. Nat. Resour., Cent. Reg. Sci. Technol. Devel. Unit, North Bay, ON. 25 pp.

Ontario Ministry of Natural Resources. 1995. Hardwood Program. *In* Central Region Science and Technology: annual report 1994-1995. Ont. Min. Nat. Resour., Cent. Reg. Sci. Technol. Devel. Unit, North Bay, ON. 38 pp.

Rice, J.A., Woods, M.E., Batchelor, B.D. 1998. SCANSS: Silvicultural calibration of Algoma/North Shore stands: a progress report. Ont. Min. Nat. Resour., Southcent. Sci Sect., North Bay, ON. Tech. Rep. No. 103. 22 pp.

1.27.3 Central Region growth and yield network

Study pseudonyms	N/A
Study instigator	Murray Woods
Associated staff	N/A
Current contact	Murray Woods
Abstract	A network of growth and yield plots has been established throughout central Ontario. In addition to establishing new plots, a series of historical plots were evaluated and incorporated where appropriate. Data collected and analyzed from this network is critical in the development of models for forest management planning and wood supply analyses.
Objectives	To facilitate the establishment, maintenance, and regular collection of growth data from an extensive network of PSPs. To develop growth and yield models designed to address local needs and priorities.
Layout/design	Sample plot design includes a series of nested plots decreasing in size with the attributes being assessed. The standard design consists of a 6400 m^2 mortality plot containing 3 400 m^2 growth plots having 3 25 m^2 shrub/regeneration/vegetation subplots nested within (9 per plot).
Comments	Data used in Benchmark Yield Curve Project (1.23.3).
Activity	1 Active Regular–data set regularly updated and maintained
Quality	1 Excellent
Stability	1 Very Stable–current format/hard copy/backed up/annotated
Silvicultural treatments	clearcut; shelterwood; single-tree selection
Measurements	crown closure (%); basal area; DBH; height; quality class; regeneration tally; stem map; stocking; tree number; volume yields
Map types	custom site map; digital; district map; plot map
Establishment year	1992
Measurement years	multiple
Treatment years	N/A
Future measurement years	ongoing
Scheduled treatment years	N/A

Study sites	Property	Value
Central Ontario	Latitude	45 / 30
	Longitude	79 / 00
	Radius	150 km
	Site class	1
	Site class	2
	Site class	3
	Species	northern red oak
	Species	sugar maple
	Species	yellow birch
	Type	general

Data location	Property	Value
SSI (North Bay)-MNR	Analog formats	paper map(s)
	Analog formats	photographs
	Digital formats	CD-ROM
	Digital formats	FoxPro
	Digital formats	GIS

Publications

Hayden, J., Woods, M.E., Boysen, E.P., Mackenzie, J., Lewis, W., Richard, B., Brodzik, Z., Matuszyk, J., Miller, R.J. 1996. Ontario Forest Growth and Yield Program 1995-1996 annual report. Ont. Min. Nat. Resour., Ont. For. Res. Inst., Sault Ste. Marie, ON. 17 pp.

Lewis, W., Boysen, E.P., Mackenzie, J., Woods, M.E., Miller, R.J., Zakrzewski, V., Hayden, J., Matuszyk, J. 1994. Ontario's Growth and Yield Program: 1993-1994 annual report. Ont. Min. Nat. Resour., Ont. For. Res. Inst., Sault Ste. Marie, ON. 22 pp.

Ontario Ministry of Natural Resources. 1992. Hardwood Program. Pp. 7-9 in Central Region Science and Technology Development Unit: Annual report 1991-92. Ont. Min. Nat. Resour., Cent. Ont. For. Technol. Devel. Unit, North Bay, ON. 17 pp.

1.28.3 Comparison of height-diameter vs. height-age as site indicators for overmature, uneven-aged stands

Study pseudonyms	Goulais River Research Area ; Project 0-13	
Study instigator	Ben Wang	
Associated staff	N/A	
Current contact	Steve D'Eon	
Abstract	The conventional method of evaluating site quality using total height/age relationships has been accepted as the standard and site indices for various species have been developed. This study recognizes the limitations of using this method in overmature tolerant hardwood and tolerant mixedwood stands. The study tests an alternate method of using the ratio of height over DBH to evaluate site quality of uneven-aged forest stands of a mixed tolerant species. Results show that height/diameter relationships have merit for yellow birch but not for sugar maple.	
Objectives	To investigates the relationships among diameter, height growth and age of sugar maple and yellow birch. To discuss feasibility of using height over diameter as a site indicator for sugar maple and yellow birch.	
Layout/design	Sampling was conducted on 40 trees on 2 sites (20 trees per site, 10 sugar maple and 10 yellow birch).	
Comments	Very small sample size.	
Activity	4 Inactive Unavailable–data wholly or partially lost	
Quality	4 Poor	
Stability	4 Very Unstable–obsolete format/missing or damaged hard copy	
Silvicultural treatments	none	
Measurements	tree age; basal area; DBH; height; soil textures; stem analysis	
Map types	district map	
Establishment year	1963	
Measurement years	1963	
Treatment years	N/A	
Future measurement years	none scheduled	
Scheduled treatment years	none scheduled	
Study sites	**Property**	**Value**
Goulais River Research Area	Latitude	46 / 55
	Longitude	83 / 58
	Radius	100 m
	Site class	2
	Species	sugar maple
	Species	yellow birch
	Type	plot
Data location	**Property**	**Value**
Great Lakes Forestry Centre–CFS	Analog formats	paper map(s)
	Analog formats	unknown

Publications

Wang, B. S. P. 1964. Diameter, height, and age relationships of sugar maple and yellow birch in the Goulais River Area, Ontario. University of Toronto, Toronto, ON. Project 0-13. 14 pp.

1.29.3 Stem analysis in nine tolerant hardwoods stands in Sault Ste. Marie District

Study pseudonyms	N/A	
Study instigator	Richard Raper	
Associated staff	N/A	
Current contact	Murray Woods	
Abstract	Initiated by MNR District staff, the purpose of the study was to obtain preliminary growth and yield information for tolerant hardwood stands in the Sault Ste. Marie area. Species composition varied from stand to stand and within stands. The dominant species in the overstory appeared to be either sugar maple or yellow birch, while the dominant subcanopy species was sugar maple. Trends in the data were found, however, they could not be quantified with any confidence. The volume increment of individual trees was related to average distance from its neighbours.	
Objectives	To estimate potential volume of tolerant hardwoods stands by soil and site type. To determine variable rotation ages by site type for tolerant hardwoods. To assign a maximum mean annual increment value by site type to use as an index of productivity in the Northeast Region Forest Management Potential Model (FOMAP).	
Layout/design	Eighteen square TRIM plots (each 0.01 ha).	
Comments		
Activity	5 Unknown	
Quality		
Stability	5 Unknown	
Silvicultural treatments		
Measurements		
Map types	N/A	
Establishment year	unknown	
Measurement years	none scheduled	
Treatment years	none scheduled	
Future measurement years	none scheduled	
Scheduled treatment years	none scheduled	
Study sites	**Property**	**Value**
Sault Ste. Marie	Species	sugar maple
District	Species	yellow birch
Datal location	**Property**	**Value**
SSI (North Bay)-MNR	Analog formats	unknown

Publications

Ecological Services for Planning, Ltd. 1991. Final report: Northeastern Region tolerant hardwood growth and yield study results of stem analysis in nine tolerant hardwood stands in Sault Ste Marie District, Ontario. Ont. Min. Nat. Resour., Central Ont. For. Technol. Devel. Unit, North Bay, ON. Tech. Rep. No. 20. 102 pp.

1.30.3 Westwind shelterwood permanent growth plot (PGP)

Study pseudonyms	Bracebridge area; Parry Sound District; Shelterwood PGP; Westwind permanent growth plots	
Study instigator	Murray Woods	
Associated staff	Barry Davidson	
Current contact	Murray Woods	
Abstract	This study was recently initiated to improve our knowledge of growth development in hardwoods following a shelterwood cut. Comprehensive data collection efforts in both the pre- and post-harvest condition should ensure a thorough data set for analysis.	
Objectives	To quantify growth response at the individual-tree and stand level following a shelterwood harvest.	
Layout/design	Established 15 plots (6 plots in 2000; 9 plots in 2001). In addition to tree data, detailed soil and FEC data were collected.	
Comments		
Activity	1 Active Regular–data set regularly updated and maintained	
Quality	1 Excellent	
Stability	1 Very Stable–current format/hard copy/backed up/annotated	
Silvicultural treatments	shelterwood	
Measurements	crown closure (%); crown class; live/dead status; DBH; height; quality class; regeneration tally; soil moisture; soil textures; stem map	
Map types	custom site map; digital	
Establishment year	2000; 2001;	
Measurement years	2001 pre-cut; 2002 pre-cut	
Treatment years	2001; 2002	
Future measurement years	2003	
Scheduled treatment years	none scheduled	

Study sites	Property	Value
Parry Sound and Muskoka	Latitude	45 / 30
	Longitude	79 / 40
	Radius	40 km
	Site class	2
	Species	northern red oak
	Species	sugar maple
	Species	yellow birch
	Type	general
	Type	polar plot

Data location	Property	Value
SSI (North Bay)-MNR	Analog formats	photocopied sheets
	Analog formats	photographs
	Digital formats	CD-ROM
	Digital formats	FoxPro
Westwind Forest Stewardship, Inc.	Analog formats	original tally sheets
	Analog formats	paper map(s)
	Analog formats	photographs
	Digital formats	CD-ROM
	Digital formats	GIS

Publications

None

1.31.3 Hardwood growth plots

Study pseudonyms	Hardwood growth plots; Nightingale township
Study instigator	Jack Mihell
Associated staff	Carl Corbett
Current contact	Murray Woods
Abstract	These plots were established by the Algonquin Park District to quantify growth and yield within a tolerant hardwood stand.
Objectives	To document hardwood growth at the individual-tree and stand level.
Layout/design	Established 16 plots.
Comments	
Activity	5 Unknown
Quality	5 Unknown
Stability	
Silvicultural treatments	
Measurements	crown class; DBH; quality class; stem map
Map types	district map
Establishment year	1985
Measurement years	1985
Treatment years	
Future measurement years	none scheduled
Scheduled treatment years	none scheduled

Study sites	Property	Value
Nightingale township	Latitude	45 / 27
	Longitude	78 / 25
	Radius	150 m
	Site class	1
	Site class	2
	Species	sugar maple
	Type	polar plot

Data location	Property	Value
SSI (North Bay)-MNR	Analog formats	paper map(s)
	Analog formats	unknown

Publications

None

1.32.3 Influence of logging damage on growth and development

Study pseudonyms	Algonquin Park; Louisa Flats	
Study instigator	Jack Mihell	
Associated staff	N/A	
Current contact	Murray Woods	
Abstract	Following harvesting on this site, significant damage was apparent. The study was initiated to determine how logging damage affected the stand's subsequent growth.	
Objectives	To quantify the effects of logging damage on stand growth and development.	
Layout/design	Established 30 plots, data were not collected on logging damage at the individual tree level.	
Comments	Data used in provincial growth and yield plot network. Data used in Benchmark Yield Curve Project (1.23.3).	
Activity	1 Active Regular–data set regularly updated and maintained	
Quality	1 Excellent	
Stability	1 Very Stable–current format/hard copy/backed up/annotated	
Silvicultural treatments	single-tree selection	
Measurements	crown closure (%); basal area; crown quality; live/dead status; DBH; height; quality class; stem map;	
Map types	custom site map; FRI scale 1:15,840; sketch	
Establishment year	1982	
Measurement years	1982; 1983; 1985; 1987; 1988; 1990; 1991; 1995; 1998; 2001	
Treatment years	1982	
Future measurement years	none scheduled	
Scheduled treatment years	none scheduled	
Study sites	Property	Value
Nightingale township	Latitude	45 / 28
	Longitude	78 / 26
	Radius	150 m
	Site class	1
	Site class	2
	Species	American beech
	Species	sugar maple
	Type	plot
Data location	Property	Value
SSI (North Bay)-MNR	Analog formats	original tally sheets
	Analog formats	paper map(s)
	Analog formats	photocopied sheets
	Digital formats	5.25" floppy disk

Publications

Rice, J.A. (ed.).1994. Logging damage: the problems and practical solutions. Ont. Min. Nat. Resour., Ont. For. Res. Inst., Sault Ste. Marie, ON. For. Res. Inf. Pap. No. 117. 70 pp.

1.33.3 Logging damage Stokes plots

Study pseudonyms	Bracebridge area; Limberlost Road; Marion Lake south
Study instigator	Dave Deugo
Associated staff	Robert Stokes
Current contact	Murray Woods
Abstract	This study was initiated to further educate loggers about the importance of and need for careful logging (improved skid trail layout, closely supervised cut, and skid crews). The intent was to demonstrate that by not adhering to desired logging methods, the forest would be degraded. Documentation that illustrates and explains the mechanical, biological, and pathological processes associated with logging damage, and the long-term effects of harvesting techniques on the future stand, and contains recommendations for improving existing operations was needed.
Objectives	To determine the type(s) and extent of damage caused by logging in tolerant hardwood stands. To establish a simple yet accurate method for appraising logging damage.
Layout/design	Twelve plots were established.
Comments	Data used in Benchmark Yield Curve Project (1.23.3). Unpublished report produced.
Activity	2 Active Irregular–data set irregularly updated and maintained
Quality	1 Excellent
Stability	1 Very Stable–current format/hard copy/backed up/annotated
Silvicultural treatments	single-tree selection
Measurements	tree age; basal area; crown class; crown quality; logging damage; DBH; quality class; stem map;
Map types	FRI scale 1:15,840
Establishment year	1983
Measurement years	1983; 1984
Treatment years	
Future measurement years	none scheduled
Scheduled treatment years	none scheduled

Study sites	Property	Value
Finlayson township, Conc 11, Lot 19	Latitude	45 / 30
	Longitude	78 / 55
	Radius	24 m
	Site class	1
	Site class	2
	Species	sugar maple
	Type	polar plot

Data location	Property	Value
SSI (North Bay)-MNR	Analog formats	paper map(s)
	Analog formats	photocopied sheets
	Digital formats	CD-ROM

Publications

Anderson, H.W. 1994. Some implications of logging damage in the tolerant hardwood forests of Ontario. Pp. 3-28 *in* Rice, J.A., (ed.) Logging damage: the Problems, and Practical Solutions. Ont. Min. Nat. Resour., Ont. For. Res. Inst., Sault Ste. Marie, ON, For. Res. Inf. Pap. No. 117. 70 pp.

Ontario Ministry of Natural Resources. 1992. Hardwood Program. Pp. 7-9 *in* Central Region Science and Technology Development Unit: annual report 1991-92. Ont. Min. Nat. Resour., Cent. Ont. For. Technol. Devel. Unit, North Bay, ON. 17 pp.

Ontario Ministry of Natural Resources. 1993. Hardwood Program. *In* Central Region Science and Technology Development Unit: annual report 1992-1993. Ont. Min. Nat. Resour., Cent. Ont. Sci. Technol. Devel. Unit, North Bay, ON. 28 pp.

Rice, J.A. (ed.).1994. Logging damage: the problems and practical solutions. Ont. Min. Nat. Resour., Ont. For. Res. Inst., Sault Ste. Marie, ON. For. Res. Inf. Pap. No. 117. 70 pp.

1.34.3 Logging damage survey comparing season of harvest

Study pseudonyms	Bracebridge area; Livingstone township	
Study instigator	Mike Walsh	
Associated staff	Dave Deugo	
Current contact	Mike Walsh	
Abstract	This study assessed the effect of logging on residual stand and site condition. Logging damage was recorded by cause, location on tree, nature and size of injury, and the seriousness of the wound. Study data showed spring operations did double the damage to sites, advanced regeneration, and residual trees as similar operations conducted in the fall/winter.	
Objectives	To demonstrate the susceptibility of tolerant hardwoods to damage during spring logging.	
Layout/design	Seven blocks containing 72 plots (0.1 acre (0.04 ha)) were established, 41 plots (4 blocks) received operations in the spring and 31 plots (3 blocks) were operated in the fall and winter.	
Comments	Unpublished report produced.	
Activity	3 Inactive Available–data set static/available	
Quality	2 Good	
Stability	3 Moderately Unstable–obsolete format/poor hard copy	
Silvicultural treatments	single-tree selection	
Measurements	basal area; logging damage; stocking; tree number	
Map types	district map	
Establishment year	1979	
Measurement years	1979; 1980	
Treatment years	1979; 1980	
Future measurement years	none scheduled	
Scheduled treatment years	none scheduled	
Study sites	**Property**	**Value**
Livingstone township	Latitude	45 / 20
	Longitude	78 / 45
	Site class	1
	Site class	2
	Species	sugar maple
	Type	plot
Data location	**Property**	**Value**
Bracebridge Area	Analog formats	original tally sheets
Office–MNR	Analog formats	paper map(s)
OFRI–MNR	Analog formats	photocopied sheets

Publications

Rice, J.A. (ed.).1994. Logging damage: the problems and practical solutions. Ont. Min. Nat. Resour., Ont. For. Res. Inst., Sault Ste. Marie, ON. For. Res. Inf. Pap. No. 117. 70 pp.

1.35.3 Investigation of selection harvesting damage

Study pseudonyms	Forestry Research Partnership Project #130-006; FRP logging damage study; Harvesting impacts in tolerant hardwood forests; Investigation of selection harvesting damage to tolerant hardwood stands in central Ontario; Joly township
Study instigator	Al Corlett
Associated staff	Al Stinson
Current contact	Murray Woods
Abstract	A comprehensive study to explain relationships between logging damage, by harvest method and season, and resulting growth rates. Permanent growth plots (PGPs) were randomly located in stands that were allocated for harvest under the single-tree selection system. Five plots were located within each stand. As of January 2003, 131 PGPs have been established in tolerant hardwood stands. Preliminary findings suggest that saplings and poles are most susceptible to damage and that a gain in acceptable growing stock (AGS) following marking is likely closer to 10% than the previously suggested 20% value. This has major implications to wood supply and product mixes. Scheduled for harvest in the Parry Sound and North Bay Districts. For each species, seedlings (<50 cm), regeneration (50 cm to 1.30 m) and saplings (greater than 1.3 m tall but less than 2.5 cm DBH) were assessed. Percent cover was estimated for the regeneration class. Density counts were completed by species for both the regeneration and sapling class.
Objectives	To quantify the long-term growth and yield and timber quality implications of logging damage related to harvesting activity. To identify (where possible) means of extending periods of operability in the spring (high bark shear susceptibility) and fall (high risk of soil saturation and rutting) without compromising stem quality.
Layout/design	Each permanent growth plot (PGP) is 0.1 ha (17.84 m radius) and includes 3 25 m^2 regeneration plots. A matrix was designed to sample in 3 seasons and 2 harvesting methods (mechanized harvesting with fellerbunchers and more traditional harvesting with a chainsaw and skidder). 'Blind' plots (no evidence that a PGP exists) were used to minimize harvesting bias (more careful harvesting practices within the plots)
Comments	Details available on "Logging Damage/Yield Curve Workshop", CEC, Feb.3, 2003 CD-ROM. Several stands were selected that were harvested under the uniform shelterwood system.
Activity	1 Active Regular–data set regularly updated and maintained
Quality	1 Excellent
Stability	1 Very Stable–current format/hard copy/backed up/annotated
Silvicultural treatments	single-tree selection
Measurements	crown class; crown size; logging damage; DBH; insect and disease conditions; regeneration tally; soil textures; stem map
Map types	custom site map; digital
Establishment year	2001
Measurement years	2001; 2002
Treatment years	2002
Future measurement years	2006; 2011; 2016; 2021
Scheduled treatment years	2003; 2004; 2005

Study sites	Property	Value
Parry Sound, North Bay and Pembroke Districts	Latitude	46 / 00
	Longitude	78 / 45
	Radius	85 km
	Site class	1
	Site class	2
	Site class	3
	Species	sugar maple
	Species	yellow birch
	Type	general

Data location	Property	Value
SSI (North Bay)-MNR	Analog formats	original tally sheets
	Analog formats	paper map(s)
	Analog formats	photographs
	Digital formats	ASCII
	Digital formats	CD-ROM
	Digital formats	GIS

Publications

None

1.36.3 Forest health plot network

Study pseudonyms	Acid rain; Hardwood decline survey; Maple decline; Maple dieback	
Study instigator	Dave McLaughlin	
Associated staff	Murray Woods; Eric Boysen	
Current contact	Dave McLaughlin	
Abstract	The Ministry of Environment and Energy (MOEE) established a network of plots to assess crown dieback in sugar maple stands. Annual crown assessments were conducted. A partnership between MOEE and OMNR (Forest Health and Silviculture Section; growth and yield) is being considered to maintain this plot network.	
Objectives	To determine the causal factors of sugar maple decline at selected sites in Ontario. To assess the role of atmospheric pollutants in the current sugar maple decline episode.	
Layout/design	110 PSPs (A-001 to A-110) established in Ontario (49 plots in Central Region). Plot are 60 x 60 m.	
Comments	Diameter data was collected for the years 1986 and 1991. Detailed written directions for accessing sites exist.	
Activity	3 Inactive Available–data set static/available	
Quality	1 Excellent	
Stability	2 Moderately Stable–current format/hard copy	
Silvicultural treatments	none	
Measurements	crown quality; live/dead status; dieback level; stem map	
Map types	custom site map	
Establishment year	1985	
Measurement years	1986; 1987; 1988; 1990; 1991; 1992; 1993; 1994	
Treatment years		
Future measurement years	none scheduled	
Scheduled treatment years	none scheduled	
Study sites	**Property**	**Value**
Ontario -Thunder Bay through to Cornwall	Latitude	47 / 00
	Longitude	81 / 00
	Radius	550 km
	Site class	1
	Site class	2
	Species	sugar maple
	Type	general
Data location	**Property**	**Value**
SSI (North Bay)-MNR	Analog formats	paper map(s)
	Analog formats	photocopied sheets

Publications

McLaughlin, D.L. 1985. Summary report of questionnaires distributed to the Ontario Maple Syrup Producers Association. Pp. 445-447 *in* Romanyk, S. 1988. Sugar maple (*Acer saccharum* Marsh.) Canada's national emblem. Ont. Min. Nat. Resour., Toronto, ON. Vol. 1 of 2. 922 pp.

McLaughlin, D.L., Kinch, C., Liljalehto, H., Boysen, E.P. 1996. Hardwood forest health surveys in Ontario–The first 10 years (oral presentation). *In* The Right Stuff for the Future: Proceedings of the Northeastern Forest Soils and the Great Lakes Forest and Soils Conference, July 7-9, 1996, Swan Lake Forest Research Reserve, Algonquin Provincial Park, ON. 87 pp.

McLaughlin, D.L., Linzon, S.N., Dimma, D.E., McIlveen, W.D. 1985. Sugar maple decline in Ontario. Ont. Min. Environ., Toronto, ON. Air Resour. Br. Rep. ARB-144-85-Phyto. 18 p.

1.37.3 Sugar maple quality

Study pseudonyms	Artificial fire damage study; Branch stub wound study; Dwight; Fire damage study; Fletcher Lake; Hardwood Lake; Logging damage; Porcupine Lake; Raven Lake; Shoe Lake; SMaQS (sugar maple quality study); Swan Lake Forest Research Reserve	
Study instigator	Harvey Anderson	
Associated staff	J.T. Basham	
Current contact	William Cole	
Abstract	A series of exploratory studies were conducted in the townships north of Dorset to gain a better understanding of the relationship between quality and defect, branch stubs, fire and logging wounds (real and simulated), sunscald, canker, frost cracks, narrow seams, and sugar maple borer damage.	
Objectives	To gain a better understanding of the influence of biotic and abiotic factors on sugar maple health and quality.	
Layout/design	Temporary sample plots (stratified samples).	
Comments		
Activity	3 Inactive Available–data set static/available	
Quality	2 Good	
Stability	3 Moderately Unstable–obsolete format/poor hard copy	
Silvicultural treatments	none	
Measurements	basal area; crown quality; browse damage; logging damage; DBH; height; tree number	
Map types	sketch	
Establishment year	1959; 1960;	
Measurement years	1959; 1960; 1961; 1962	
Treatment years	N/A	
Future measurement years	none scheduled	
Scheduled treatment years	none scheduled	
Study sites	**Property**	**Value**
Haliburton County north	Latitude	45 / 20
	Longitude	78 / 50
	Radius	20 km
	Site class	1
	Site class	2
	Species	sugar maple
	Type	general
	Type	plot
Data location	**Property**	**Value**
OFRI–MNR (And.)	Analog formats	paper map(s)
	Analog formats	photocopied sheets

Publications

Anderson, H.W. 1960. Some observations on the quality of sugar maple in two second-growth tolerant hardwood stands of differing cutting history. Ont. Dept. Lands For., Res. Br., Maple, ON, File Rep. No. 122. 18 pp.

Anderson, H.W. 1964. Some notes on defect development in sapling and pole-sized sugar maple. Ont. Dept. Lands For., Res. Br., Maple, ON. 58 pp.

Anderson, H.W. 1973. Hardwood defects. Pp. 37-58 *in* Management of Tolerant Hardwoods in Algonquin Provincial Park. Ont. Min. Nat. Resour., Div. For., For. Manage. Br., Toronto, ON. 84 pp.

Anderson, H.W. 1973. Some ecological aspects of quality control in trees and stands. Ont. Min. Nat. Resour., Div. For., Res. Br., Maple, ON, File Rep. 6-73. 46 pp.

Anderson, H.W. 1983. Individual tree growth and quality potential. Pp. 17-28 *in* Management of Tolerant Hardwoods in Algonquin Provincial Park. Ont. Min. Nat. Resour., For. Manage. Br., Toronto, ON. 72 pp

Anderson, H.W. 1994. Some implications of logging damage in the tolerant hardwood forests of Ontario. Pp. 3-28 *in* Rice, J.A., (ed.) Logging damage: The Problems, and Practical Solutions. Ont. Min. Nat. Resour., Ont. For. Res. Inst., Sault Ste. Marie, ON, For. Res. Inf. Pap. No. 117. 70 pp.

Anderson, H.W., McLean, M.M. 1970. Value-increase potential of various grades of sugar maple trees. Ont. Dept. Lands For., Res. Br., Maple, ON. Unpubl. Rep. 19 pp.

Basham, J.T., Anderson, H.W. 1977. Defect development in second-growth sugar maple in Ontario. I. Microfloral infection relationships associated with dead branches. Can. J. Bot. 55: 934-976.

1.38.3 Turkey Lakes trial of SCANSS

Study pseudonyms	Catchment No. 33; Turkey Lakes watershed #33
Study instigator	Murray Woods
Associated staff	Jim Rice; Brian Batchelor; William Cole
Current contact	Murray Woods
Abstract	This trial application of the Silvicultural Calibration of Algoma/North Shore Stands (SCANSS) methodology is located within the Turkey Lakes Watershed area. The Turkey Lakes Watershed hosts a number of long-term studies on ecosystem effects of air pollutants and more recently environmental effects of forestry practices on tolerant hardwood forests.
Objectives	To establish a silvicultural cutting trial to determine the long-term growth response of Algoma/North Shore tolerant hardwood stands to single-tree selection harvesting. To identify where and how much variability can be expected in pre-harvest tree marking, cutting, and post-harvest growth response under single-tree and small-group selection systems. To improve regional single-tree selection and other tolerant hardwood tree marking and harvesting practices through active communication, training, evaluation, and technology transfer.
Layout/design	Twenty circular plots, each 0.1 ha (17.8 m radius), randomly located within the 24 ha area of Watershed #33.
Comments	Data used by provincial growth and yield program.
Activity	2 Active Irregular–data set irregularly updated and maintained
Quality	1 Excellent
Stability	1 Very Stable–current format/hard copy/backed up/annotated
Silvicultural treatments	single-tree selection
Measurements	crown closure (%); basal area; logging damage; live/dead status; DBH; height; quality class; regeneration tally; stem map; stocking
Map types	plot map
Establishment year	1990
Measurement years	1996; 1997; 1998 post-cut
Treatment years	1997
Future measurement years	none scheduled
Scheduled treatment years	none scheduled

Study sites	Property	Value
Watershed # 33	Latitude	47 / 04
	Longitude	84 / 25
	Radius	250 m
	Site class	2
	Species	sugar maple
	Species	yellow birch
	Type	plot

Data location	Property	Value
OFRI–MNR	Analog formats	computer printouts
	Analog formats	paper map(s)
	Digital formats	5.25" floppy disk
	Digital formats	GIS
SSI (North Bay)-MNR	Analog formats	computer printouts
	Analog formats	paper map(s)
	Digital formats	3.5" floppy disk
	Digital formats	GIS

Publications

None

1.39.3 Management of tolerant hardwoods in Northern Ontario

Study pseudonyms	Catchment No. 31; Catchment No. 32; Catchment No. 33; Catchment No. 34; Turkey Lakes watershed #34
Study instigator	P. Hamilton
Associated staff	Gary Hogan
Current contact	Al Cameron
Abstract	During the mid-1990s, studies conducted at the Turkey Lakes Watershed were expanded beyond the original purpose of assessing effects of long-range transport of air pollutants on ecosystems to include environmental effects of forestry practices on tolerant hardwood forests. A variety of projects were initiated including a comparison of the productivity and site impacts of manual and mechanized clearcutting and partial-cutting operations and an investigation of 5 different integrated sawlog/chipping harvest operations.
Objectives	To develop environmentally sustainable silvicultural systems applicable to tolerant hardwood stands in the Algoma Section of the Great Lakes-St. Lawrence Forest Region. These systems must maintain biodiversity and cavity trees and minimize adverse on- and off-site impacts. To determine effects of forest management on the long-term productivity of soils of the Turkey Lakes Watershed. To determine effects of forest management on the diversity of plant and animal species. To determine effects of forest management on water yield and quality of headwater streams.
Layout/design	A variety evaluation formats were used to assess the various studies.
Comments	Data used by provincial growth and yield program.
Activity	2 Active Irregular–data set irregularly updated and maintained
Quality	2 Good
Stability	2 Moderately Stable–current format/hard copy
Silvicultural treatments	clearcut; harvest cut; shelterwood; single-tree selection
Measurements	crown closure (%); logging damage; soil moisture; soil nutrient analysis; soil textures; stocking
Map types	plot map
Establishment year	1997; 1998
Measurement years	1997; 1998
Treatment years	1997; 1998
Future measurement years	none scheduled
Scheduled treatment years	none scheduled

Study sites	Property	Value
Turkey Lakes Watersheds #31-34	Latitude	47 / 04
	Longitude	84 / 25
	Radius	2.2 km
	Site class	2
	Site class	3
	Species	sugar maple
	Species	yellow birch
	Type	general

Data location	Property	Value
Great Lakes Forestry Centre–CFS	Analog formats	paper map(s)
	Analog formats	photocopied sheets
	Digital formats	CD-ROM

Publications

Cameron, D.A. Undated. Biomass production from the harvesting of a tolerant hardwood stand in Algoma, Ontario. Can. For. Serv., Sault Ste. Marie Energy From Forest Programme, Sault Ste Marie, ON. 27 pp.

Foster, N.W., Nicolson, J.A., Hazlett, P.W. 1989. Temporal variation in nitrate and nutrient cations in drainage waters from a deciduous forest. J. Environ. Qual. 18(2): 238-244.

Hamilton, P. 1999. Clearcuts, shelterwood cuts, and selection cuts in the Turkey Lakes watershed. For. Engin. Res. Inst. Can., Pointe-Claire, QC. Tech. Note TN-295. 11 pp.

Morrison, I.K. 1990. Addition of organic matter and elements to the forest floor of an old-growth *Acer saccharum* forest in the annual litter fall. Can. J. For. Res. 21: 462-468.

Morrison, I.K. 1990. Organic matter and mineral distribution in an old-growth *Acer saccharum* forest near the northern limit of its range. Can. J. For. Res. 20: 1332-1342.

Morrison, I.K., Foster, N.W. 1986. Effects of acid deposition on nutrient cycling in northern hardwood forests. Pp. 139-155 *in* Mroz, G.D., Reed, D.D. (eds.) Proc. The Northern Hardwood Resource: Management and Potential, Aug.18-20, 1986, Houghton, Michigan. Mich. Tech. Univ., Houghton, MI. 434 pp.

2.01.1 Yellow birch patch dynamics

Study pseudonyms	Historically significant area
Study instigator	Harvey Anderson
Associated staff	N/A
Current contact	William Cole
Abstract	In 1953, 136 sample plots were established in conjunction with a modified harvest cutting involving creation of canopy patches of various size, shape, and orientation. Historical tallies were conducted periodically on approximately 500 microquadrats established within these plots for a period of 16 years. Survival, growth, dieback, and browse occurrence were recorded on all regenerated species. plot locations are mapped and historical datafiles are secure.
Objectives	To gain better understanding of the necessary conditions for successful yellow birch regeneration.
Layout/design	136 plots. No control. Various shapes and sizes.
Comments	
Activity	5 unknown
Quality	5 Unknown
Stability	5 Unknown
Silvicultural treatments	group selection
Measurements	browse damage; DBH; height; regeneration tally
Map types	custom site map; sketch; Swan Lake GIS--locations approximate
Establishment year	1953
Measurement years	1953
Treatment years	1953
Future measurement years	none scheduled
Scheduled treatment years	none scheduled

Study sites	Property	Value
Swan Lake Forest Research Reserve	Latitude	45 / 29 / 52
	Longitude	78 / 43 / 29
	Radius	760 m
	Site class	2
	Species	yellow birch
	Type	plot

Data location	Property	Value
OFRI--MNR	Analog formats	paper map(s)
	Digital formats	Swan Lake GIS
OFRI--MNR (And.)	Analog formats	paper map(s)
	Analog formats	unknown

Publications

Anderson, H.W. 1993. Learning to maintain biodiversity in tolerant hardwood forests. In The Role of Parks in Conserving Biodiversity: Proceedings of Provincial Parks Centennial Symposium, Sept. 1993, Dorset, ON. Ont. Min. Nat. Resour., Toronto, ON.

Anderson, H.W. 1996. Yellow birch: history, ecology, biodiversity, old-growth, and management (oral presentation). In The Right Stuff for the Future: Proceedings of the Northeastern Forest Soils and the Great Lakes Forest and Soils Conference, July 7-9, 1996, Swan Lake Forest Research Reserve, Algonquin Provincial Park, ON. 87 pp.

Anderson, H.W., Rice, J.A., Roberts, K.W., Beekers, W. 1987. Maintaining a yellow birch component using group selection (poster presentation). P. 423 in Nyland, R.D. (Ed.) Managing Northern Hardwoods: Proceedings of a Silvicultural Symposium, June 23-25, 1986, Syracuse, NY. SUNY ESF Facul. For. Misc. Publ. No. 13 (ESF 87-002). Soc. Am. For. Publ. No. 87-03. 430 pp.

Holowacz, J. 1960. Holowacz, J. 1960. Progress report on prescribed burning in the hard maple-yellow birch cover type in Ontario 1958-1959. Ont. Dept. Lands For., Res. Br., Maple, ON. For. Sec. Rep. No. 37. 16 pp.. Ont. Dept. Lands For., Res. Br., Maple, ON. For. Sec. Rep. No. 37. 16 pp.

2.02.1 Yellow birch recruitment

Study pseudonyms	Gate plot
Study instigator	Harvey Anderson
Associated staff	Jim Rice
Current contact	William Cole
Abstract	This study is located in a larger area that was patch cut in the 1953 experimental yellow birch regeneration cuttings but the specific plot was not harvested. Around 1959, the area was used as a holding area for tubelings of red pine. A small area was site prepared and fenced to hold the tubelings. After a year or so, the area was abandoned, leaving a few red pine seedlings and the fence intact. As a result of the good seedbed and fence protection, yellow birch and a few other species (Cb, Bw, etc.) became established naturally. The red pine ultimately succumbed to competition from the hardwoods. Researchers had observed the impressive stocking and growth of the yellow birch, which had occurred under a natural canopy gap. In 1989, a single polar plot was established to encompass the entire patch, extending into the area occupied by overstory trees.
Objectives	To study the recruitment of yellow birch regeneration under a canopy gap (e.g., optimal size canopy openings for yellow birch establishment and growth). To explore yellow birch regeneration on a fractured site compared to the drumlin site that the Yellow Birch Patch Dynamics Study (2.01.1) is located on.
Layout/design	Single 0.64 ha polar plot; no control; no replication (but complemented by Regeneration Tally of Yellow Birch (McClintock township) 2.12.1).
Comments	Located within the larger Yellow Birch Patch Dynamics Study (2.01.1); the area was videotaped in connection with the Regenerating yellow birch video (OMNR 1995). Most of the coverage is preserved in the original stock footage cassettes.
Activity	2 Active Irregular–data set irregularly updated and maintained
Quality	2 Good
Stability	1 Very Stable–current format/hard copy/backed up/annotated
Silvicultural treatments	fenced off; planting; site preparation
Measurements	crown class; DBH; height; quality class; stem map
Map types	plot map; sketch linked to road traverse; Swan Lake GIS–locations approximate
Establishment year	1989
Measurement years	1989; 1990; 1991
Treatment years	1960
Future measurement years	2011
Scheduled treatment years	none scheduled

Study sites	Property	Value
Swan Lake Forest Research Reserve	Latitude	45 / 30 / 13
	Longitude	78 / 43 / 28
	Radius	48 m
	Site class	1
	Species	yellow birch
	Type	polar plot

Data location	Property	Value
OFRI–MNR (And.)	Analog formats	paper map(s)
	Digital formats	ASCII
	Digital formats	Swan Lake GIS

Publications

Anderson, H.W. 1993. Learning to maintain biodiversity in tolerant hardwood forests. *In* The Role of Parks in Conserving Biodiversity: Proceedings of Provincial Parks Centennial Symposium, Sept. 1993, Dorset, ON. Ont. Min. Nat. Resour., Toronto, ON.

Anderson, H.W. 1996. Yellow birch: History, ecology, biodiversity, old-growth, and management (oral presentation). *In* The Right Stuff for the Future: Proceedings of the Northeastern Forest Soils and the Great Lakes Forest and Soils Conference, July 7-9, 1996, Swan Lake Forest Research Reserve, Algonquin Provincial Park, ON. 87 pp.

Anderson, H.W., Rice, J.A., Roberts, K.W., Beekers, W. 1987. Maintaining a yellow birch component using group selection (poster presentation). P. 423 *in* Nyland, R.D. (Ed.) Managing Northern Hardwoods: Proceedings of a Silvicultural Symposium, June 23-25, 1986, Syracuse, NY. SUNY ESF Facul. For. Misc. Publ. No. 13 (ESF 87-002). Soc. Am. For. Publ. No. 87-03. 430 pp.

Holowacz, J. 1960. Progress report on prescribed burning in the hard maple-yellow birch cover type in Ontario 1958-1959. Ont. Dept. Lands For., Res. Br., Maple, ON. For. Sec. Rep. No. 37. 16 pp.

Ontario Ministry of Natural Resources. 1995. Regenerating yellow birch. Ont. Min. Nat. Resour., Ont. For. Res. Inst., Sault Ste. Marie, ON. Video (VHS) Recording, 63 minutes.

Ontario Ministry of Natural Resources. 1995. Yellow birch story: Script for Regenerating Yellow Birch. Ont. Min. Nat. Resour., Ont. For. Res. Inst., Sault Ste. Marie, ON. 66 pp.

2.03.1 Swan Lake prescribed burn dynamics

Study pseudonyms	Prescribed burn physics; Prescribed fire physics
Study instigator	Don Burton
Associated staff	Harvey Anderson; N.H. Sloane
Current contact	William Cole
Abstract	In the fall of 1958, a prescribed burning experiment was initiated at Swan Lake. A 5-ha (12 acre) site was divided into 2 replications. Each replication was divided into 6 plots to compare 5 levels of burning plus a control. The control was left unburned while the remaining 5 plots in each replication were randomly selected to be burned with from one to five annual fires. Evaluations of the site looked at number and size of trees killed, regeneration quantity and species, and soil microbial and elemental dynamics before and after the fires.
Objectives	The objective of the experiment was to understand the logistics of prescribed burning and to investigate the effects of prescribed fire on local cover types as well as the efficiency of fire for seedbed preparation and reduction of undesirable competition. To investigate prescribed fire as a means of creating a favourable seedbed for yellow birch regeneration
Layout/design	Randomized complete block with control. Plots burned 0 to 5 consecutive years.
Comments	Plots re-staked in 1989. Data missing, summary reports only.
Activity	4 Inactive Unavailable--data wholly or partially lost
Quality	3 Fair
Stability	3 Moderately Unstable--obsolete format/poor hard copy
Silvicultural treatments	prescribed burn
Measurements	regeneration tally; soil nutrient analysis
Map types	custom site map; sketch; Swan Lake GIS--locations approximate
Establishment year	1958
Measurement years	1958; 1960; 1961; 1962; 1963
Treatment years	1958; 1960; 1961; 1962; 1963
Future measurement years	none scheduled
Scheduled treatment years	none scheduled

Study sites	Property	Value
Swan Lake Forest Research Reserve	Latitude	45 / 28 / 58
	Longitude	78 / 43 / 45
	Radius	200 m
	Site class	1
	Species	American beech
	Species	sugar maple
	Species	yellow birch
	Type	plot

Data location	Property	Value
OFRI--MNR	Analog formats	paper map(s)
OFRI--MNR (And.)	Analog formats	black and white prints
	Analog formats	paper map(s)
	Analog formats	photocopied sheets
	Digital formats	hardwood archive
	Digital formats	Swan Lake GIS

Publications

Anderson, H.W. 1993. Learning to maintain biodiversity in tolerant hardwood forests. *In* The Role of Parks in Conserving Biodiversity: Proceedings of Provincial Parks Centennial Symposium, Sept. 1993, Dorset, ON. Ont. Min. Nat. Resour., Toronto, ON.

Anderson, H.W., Rice, J.A. 1990. Swan Lake Forest Research Reserve, Algonquin Provincial Park: General tour guide. Ont. Min. Nat. Resour., Ont. For. Res. Inst., Sault Ste. Marie, ON. Unpubl. Rep. 35 pp.

Holowacz, J. 1960. Progress report on prescribed burning in the hard maple-yellow birch cover type in Ontario 1958-1959. Ont. Dept. Lands For., Res. Br., Maple, ON. For. Sec. Rep. No. 37. 16 pp.

Ontario Ministry of Natural Resources. 1995. Regenerating yellow birch. Ont. Min. Nat. Resour., Ont. For. Res. Inst., Sault Ste. Marie, ON. Video (VHS) Recording, 63 minutes.

2.04.1 Yellow birch regeneration dynamics

Study pseudonyms	Yellow birch drumlin exclosure; Yellow birch stand dynamics
Study instigator	Harvey Anderson
Associated staff	Jim Rice
Current contact	William Cole
Abstract	This study was established to determine requirements and recommend silvicultural procedures to resource managers for regenerating yellow birch in the tolerant hardwood forests of central Ontario, and to study the dynamics of yellow birch both individually and in groups of regeneration and saplings. Birch regeneration was monitored on various site conditions (burn/unburned; cut/uncut) using a series of microquadrats. Optimum growing conditions were determined by looking at survival and height of the sapling in relation to harvesting (cut or not cut) and site prep (burn or unburned, scarified or not scarified) treatments. The residual stand affected the growth and development of the yellow birch. In the late 1970s, residual trees were mapped and back-projected so that residual stand development over time could be discerned. The area has continued to be monitored to study the natural dynamics of yellow birch regeneration. Information gathered from this and the other early birch experiments form the basis for yellow birch regeneration prescriptions currently used by resource managers in central Ontario.
Objectives	To test silvicultural techniques to encourage yellow birch regeneration (e.g., group selection harvest, seedbed disturbance, good seed year timing, and browse protection).
Layout/design	Total area 5 acres (2.02 ha). Half the area was prescribed burned. A number of plots were established and followed over time.
Comments	A very important study as it built on earlier investigations and clearly demonstrated and documented requirements for successful yellow regeneration
Activity	3 Inactive Available–data set static/available
Quality	2 Good
Stability	3 Moderately Unstable–obsolete format/poor hard copy
Silvicultural treatments	fenced off; group selection; prescribed burn; manual scarification; single-tree selection
Measurements	browse damage; height; regeneration tally; stem analysis
Map types	custom site map; plot map; Swan Lake GIS–locations approximate
Establishment year	1959
Measurement years	1959; 1960; 1961; 1962; 1964; 1965; 1966; 1967; 1968; 1971; 1978; 1979; 1980; 1983; 1984;
Treatment years	1960; 1961
Future measurement years	2004
Scheduled treatment years	none

Study sites	Property	Value
Swan Lake Forest Research Reserve	Latitude	45 / 28 / 48
	Longitude	78 / 43 / 45
	Radius	75 m
	Site class	1
	Species	yellow birch
	Type	polar plot

Data location	Property	Value
OFRI–MNR (And.)	Analog formats	original tally sheets
	Analog formats	paper map(s)
	Digital formats	Swan Lake GIS

Publications

Anderson, H.W. 1983. Silvical characteristics influencing management options. Pp. 8-17 *in* Management of Tolerant Hardwoods in Algonquin Provincial Park. Ont. Min. Nat. Resour., For. Manage. Br., Toronto, ON. 72 pp.

Anderson, H.W. 1993. Learning to maintain biodiversity in tolerant hardwood forests. *In* The Role of Parks in Conserving Biodiversity: Proceedings of Provincial Parks Centennial Symposium, Sept. 1993, Dorset, ON. Ont. Min. Nat. Resour., Toronto, ON.

Anderson, H.W. 1996. Yellow birch: History, ecology, biodiversity, old-growth, and management (oral presentation). *In* The Right Stuff for the Future: Proceedings of the Northeastern Forest Soils and the Great Lakes Forest and Soils Conference, July 7-9, 1996, Swan Lake Forest Research Reserve, Algonquin Provincial Park, ON. 87 pp.

Anderson, H.W., Batchelor, B.D., Corbett, C.M., Deugo, D.T., Husk, C.F., Wilson, W.R. 1990. A silvicultural guide for the tolerant hardwood working group in Ontario. Ont. Min. Nat. Resour., Toronto, ON. Sci. Technol. Ser. Vol. 7. 178 pp.

Anderson, H.W., Rice, J.A. 1990. Swan Lake Forest Research Reserve, Algonquin Provincial Park: General tour guide. Ont. Min. Nat. Resour., Ont. For. Res. Inst., Sault Ste. Marie, ON. Unpubl. Rep. 35 pp.

Anderson, H.W., Rice, J.A., Roberts, K.W., Beekers, W. 1987. Maintaining a yellow birch component using group selection (poster presentation). P. 423 *in* Nyland, R.D. (Ed.) Managing Northern Hardwoods: Proceedings of a Silvicultural Symposium, June 23-25, 1986, Syracuse, NY. SUNY ESF Facul. For. Misc. Publ. No. 13 (ESF 87-002). Soc. Am. For. Publ. No. 87-03. 430 pp.

Anderson, H.W., Roberts, K.W., Rice, J.A., Beekers, W. 1985. Ecology and silviculture of tolerant hardwoods (poster presentation). *In* Proc. Can. Ont. Joint For. Res. Comm. Symp., Geneva Park, ON.

Bruce, D.S., Heeney, C.J. 1977. A silvicultural guide to the hard maple, yellow birch, and hemlock working group in Ontario. Ont. Min. Nat. Resour. Maple, ON. 50 pp.

Burton, D.H., Anderson, H.W., Riley, L.F. 1969. Natural regeneration of yellow birch in Canada. Pp. 55-73 *in* Proc. Birch symposium, Aug. 19-21, 1969, Univ. New Hampshire, Durham, NH. USDA For. Serv., Northeast For. Exp. Stn., Upper Darby, PA. 183 pp.

Holowacz, J. 1960. Progress report on prescribed burning in the hard maple-yellow birch cover type in Ontario 1958-1959. Ont. Dept. Lands For., Res. Br., Maple, ON. For. Sec. Rep. No. 37. 16 pp.

Ontario Ministry of Natural Resources. 1992. Hardwood Program. Pp. 7-9 in Central Region Science and Technology Development Unit: Annual report 1991-92. Ont. Min. Nat. Resour., Cent. Ont. For. Technol. Devel. Unit, North Bay, ON. 17 pp.

Ontario Ministry of Natural Resources. 1995. Regenerating yellow birch. Ont. Min. Nat. Resour., Ont. For. Res. Inst., Sault Ste. Marie, ON. Video (VHS) Recording, 63 minutes. with prescribed fire

Ontario Ministry of Natural Resources. 1995. Yellow birch story: Script for Regenerating Yellow Birch. Ont. Min. Nat. Resour., Ont. For. Res. Inst., Sault Ste. Marie, ON. Video (VHS) Recording, 63 minutes.

Ontario Ministry of Natural Resources. 2000. A silvicultural guide to managing southern Ontario forests, Ver 1.1. Ont. Min. Nat. Resour., Toronto, ON. 648 pp.

2.05.1 Yellow birch experimental seed orchard

Study pseudonyms	Clone bank; Garden plot
Study instigator	Al Carmichael
Associated staff	Harvey Anderson
Current contact	William Cole
Abstract	A small clonal archive of yellow birch grafts was established in a former logging landing. Survival and growth were tallied for 15 years. Orchard stock has suffered from ice damage and disease, which has helped to rogue-out unsuitable clones. This experimental orchard was not intended to produce sufficient quantities of seed for operational purposes; production orchards would be established elsewhere if warranted.
Objectives	To explore the feasibility of producing yellow birch seed from an orchard.
Layout/design	Twelve clones of grafted stock were planted.
Comments	
Activity	4 Inactive Unavailable–data wholly or partially lost
Quality	5 Unknown
Stability	4 Very Unstable–obsolete format/missing or damaged hard copy
Silvicultural treatments	fenced off; planting
Measurements	DBH; height
Map types	custom site map; plot map; sketch
Establishment year	1971
Measurement years	1971; 1972; 1973; 1974; 1975; 1976; 1977; 1978; 1979; 1980; 1981; 1993
Treatment years	
Future measurement years	none scheduled
Scheduled treatment years	none scheduled

Study sites	Property	Value
Swan Lake Forest Research Reserve	Latitude	45 / 28 / 41
	Longitude	78 / 43 / 51
	Radius	50 m
	Species	yellow birch
	Type	plot

Data location	Property	Value
OFRI–MNR	Analog formats	unknown
OFRI–MNR (And.)	Analog formats	paper map(s)

Publications

None

2.06.1 Group selection in tolerant hardwoods

Study pseudonyms	Headquarters silvicultural area; Project P 242; Stand 2-32	
Study instigator	Unknown	
Associated staff	Craig Robinson	
Current contact	Steve D'Eon	
Abstract	A variable number and size of openings have been created during harvest operations in this tolerant hardwood stand. Through regeneration surveys, the species and number of saplings have been recorded in harvested and unharvested plots.	
Objectives	To determine how canopy openings created during group selection harvesting have influenced the composition of subsequent natural regeneration.	
Layout/design	Stand is 13.4 ha; study includes plots in harvested and unharvested (19) areas.	
Comments		
Activity	2 Active Irregular–data set irregularly updated and maintained	
Quality	2 Good	
Stability	2 Moderately Stable–current format/hard copy	
Silvicultural treatments	group selection; improvement cut	
Measurements	basal area; regeneration tally; stocking	
Map types	custom site map; sketch	
Establishment year	1958	
Measurement years	1971; 1999; 2000	
Treatment years	1921-30; 1948; 1958; 1962; 1972; 1984	
Future measurement years	none scheduled	
Scheduled treatment years	none scheduled	
Study sites	Property	Value
Petawawa Research Forest/Headquarters Silv.	Latitude	45 / 58
	Longitude	77 / 31
	Site class	2
	Species	American beech
	Species	sugar maple
	Species	yellow birch
	Type	plot
Data location	Property	Value
Petawawa Research Forest	Analog formats	original tally sheets
	Analog formats	photographs

Publications

Stiell, W.M. 1974. Proceedings: Canadian Forestry Service Hardwoods Management Workshop, Sept. 24-26, 1974, Petawawa, ON. Can. Dept. Environ., Can. For. Serv., For. Manage. Inst., Ottawa, ON. 255 pp.

2.07.2 Yellow birch thinning

Study pseudonyms	Compartment 7, Headquarters Block; Maunsell Lake yellow birch; Project PI-12-064; PSP 395 and 396
Study instigator	Unknown
Associated staff	Steve D'Eon
Current contact	Craig Robinson
Abstract	Following earlier treatments, the stand was heavily thinned in 1966 to promote existing yellow birch. Permanent sample plots 395 and 396 were established in 1967 to monitor stand development. Study suggests that for yellow birch, low post-harvest basal area (10 m^2/ha) can result in trees of good form (i.e., acceptable levels of epicormic branching). PSP 127 provides historical stand conditions for the study.
Objectives	To study the growth and development of a relatively pure even-aged yellow birch stand following thinning.
Layout/design	Two plots; 0.10 acres (0.04 ha) each.
Comments	Data used in Benchmark Yield Curve Project (1.23.3). Excellent records of stand development dating back to 1921. Desirable to measure saplings in 2003, as yellow birch is decreasing while hemlock is increasing.
Activity	1 Active Regular–data set regularly updated and maintained
Quality	1 Excellent
Stability	1 Very Stable–current format/hard copy/backed up/annotated
Silvicultural treatments	girdling; harvest cut; improvement cut; thinning
Measurements	basal area; logging damage; live/dead status; DBH; height; regeneration tally; soil textures; tree number recorded
Map types	custom site map; sketch
Establishment year	1967
Measurement years	1921; 1929; 1967; 1971; 1977; 1982; 1999; 2001
Treatment years	1922; 1930; 1967; 2001
Future measurement years	2003; 2006; 2011
Scheduled treatment years	none scheduled

Study sites	Property	Value
Petawawa Research Forest/ Maunsell Lake	Latitude	45 / 58
	Longitude	77 / 31
	Radius	100 m
	Site class	1
	Species	yellow birch
	Type	plot

Data location	Property	Value
Petawawa Research Forest	Analog formats	original tally sheets
	Analog formats	paper map(s)
	Analog formats	photographs
	Digital formats	ASCII
	Digital formats	CD-ROM
	Digital formats	MS Excel

Publications

None

2.08.3 Health condition of yellow birch

Study pseudonyms	Project P-375	
Study instigator	D.A. Fraser	
Associated staff	N/A	
Current contact	Steve D'Eon	
Abstract	This study investigated the physiology and growth responses of selected yellow birch trees in various stages of decadence. The crowns of 241 yellow birch trees were assessed and classified. There was progressive improvement in crown conditions from 1949 to 1951, followed by gradual regression until 1957, when the health of the yellow birch was essentially the same as 9 years earlier. Crown health was not correlated with site quality.	
Objectives	To provide forest health information (particularly with regards to dieback) for individual yellow birch trees.	
Layout/design	Temporary sample plots, 8 acres (8 x 10 chains) (3.2 ha).	
Comments		
Activity	5 Unknown	
Quality	2 Good	
Stability	5 Unknown	
Silvicultural treatments	none	
Measurements	crown class; dieback level; soil moisture	
Map types	custom site map	
Establishment year	1949	
Measurement years	1949; 1950; 1951; 1952; 1953; 1954; 1955; 1956; 1957	
Treatment years		
Future measurement years	none scheduled	
Scheduled treatment years	none scheduled	
Study sites	Property	Value
Petawawa Research Forest/Project P-375	Latitude	45 / 58
	Longitude	77 / 31
	Radius	100 m
	Site class	1
	Site class	2
	Site class	3
	Species	yellow birch
	Type	transect
Data location	Property	Value
Petawawa Research Forest	Analog formats	paper map(s)

Publications

Fraser, D.A. 1959. Nine years of observations on the condition of 241 yellow birch. Can. Dept. North. Aff. Nat. Resour., For. Br., For. Res. Div., Ottawa, ON. Tech. Note No. 69. 23 pp.

2.09.1 Regenerating poor quality, young hardwood stands with spring prescribed burns

Study pseudonyms	Bancroft District; Watt Lake	
Study instigator	J.M. Sykes	
Associated staff	N/A	
Current contact	Bruce Fleck	
Abstract	Three consecutive spring prescribed burns were evaluated for effectiveness in regenerating a sapling-aged low quality tolerant hardwood stand.	
Objectives	To investigate effectiveness of repeated spring prescribed burning as a tool for renewing sites dominated by young poor quality growing stock.	
Layout/design	Plots A & B were 0.1 acres (0.04 ha) with a 33 foot (10 m) buffer; no control	
Comments		
Activity	4 Inactive Unavailable–data wholly or partially lost	
Quality	5 Unknown	
Stability	4 Very Unstable–obsolete format/missing or damaged hard copy	
Silvicultural treatments	clearcut; prescribed burn	
Measurements	crown quality; DBH; regeneration tally	
Map types	district map	
Establishment year	1961	
Measurement years	1961; 1962; 1963	
Treatment years	1942; 1961; 1962; 1963	
Future measurement years	none scheduled	
Scheduled treatment years	none scheduled	
Study sites	Property	Value
Herschel township	Latitude	45 / 03
	Longitude	77 / 51
	Radius	100 m
	Site class	2
	Site class	3
	Species	sugar maple
	Species	yellow birch
	Type	plot
Swan Lake Forest Research Reserve/ Scott Lake	Latitude	45 / 29 / 13
	Longitude	78 / 53 / 45
	Radius	30 m
	Site class	2
	Species	sugar maple
	Type	transect
Data location	Property	Value
Bancroft District–MNR	Analog formats	paper map(s)
OFRI–MNR	Analog formats	unknown
OFRI–MNR (And.)	Analog formats	unknown

Publications

Sykes, J.M. 1964. Report on the interim results of prescribed spring burning in a poor-quality hardwood stand. Ont. Dept. Lands For., Res. Br., Maple, ON. For. Sect. Rep. No. 49. 12 pp.

2.10.1 Scarification blocks to regenerate yellow birch

Study pseudonyms	Haliburton Forest; Kennesis Lake; Project H-92
Study instigator	J. Jarvis
Associated staff	G. Cunningham
Current contact	Peter Schleifenbaum
Abstract	Approximately 30% of the merchantable trees were harvested and all remaining defective trees greater than 10 cm DBH were girdled, thereby providing a uniform canopy of 30-40% shade at ground level (45% of stand remained as residual). Half the logged area was then mechanically site prepared. Yellow birch regeneration suffered severe rabbit damage.
Objectives	To determine if heavy cutting and site preparation (in blocks) at the time of logging will greatly improved stocking of yellow birch. To determine if adequate growing space is provided to yellow birch seedlings will this ensure that they form a dominant component of the new stand.
Layout/design	Area consists of 4, 10-acre (4 ha) sections: 2 (A and C) were chosen at random for treatment (logged and scarified with a D-6 caterpillar tractor with a straight-edged blade); 2 (B and D) were reserved for controls (logged only). Seventy-five 0.01-acre (0.004 ha) plots were established, each subdivided into 10 milliacre (4 m^2) quadrants that were randomly located and tallied.
Comments	Located on private land. Initial study arrangements were made by D.H. Burton, Ontario Department of Lands and Forests.
Activity	4 Inactive Unavailable–data wholly or partially lost
Quality	5 Unknown
Stability	4 Very Unstable–obsolete format/missing or damaged hard copy
Silvicultural treatments	fenced off; girdling; harvest cut; site preparation
Measurements	crown closure (%); browse damage; height; regeneration tally; soil moisture
Map types	custom site map
Establishment year	1953
Measurement years	1954; 1955; 1958; 1963
Treatment years	1953
Future measurement years	none scheduled
Scheduled treatment years	none scheduled

Study sites	Property	Value
Haliburton County, Eyre and Havelock townships	Latitude	45 / 19
	Longitude	78 / 33
	Radius	225 m
	Site class	2
	Species	yellow birch
	Type	plot

Data location	Property	Value
Great Lakes Forestry Centre–CFS	Analog formats	paper map(s)
	Analog formats	photocopied sheets
Haliburton Forest	Analog formats	paper map(s)

Publications

Burton, D.H., Anderson, H.W., Riley, L.F. 1969. Pp. 55-73 *in* Proc. Birch Symposium, Aug. 19-21, 1969, Univ. New Hampshire, Durham, NH. USDA For. Serv., Northeast For. Exp. Stn., Upper Darby, PA. 183 pp.

Stephenson, A.B. 1960. Browse survey in the Kennisis Lake Experimental Area, H-92. Ont. Dept. Lands For., Res. Br., Maple, ON. Wildl. File Rep. No. 61. 10 pp.

Wang, B.S.P. 1968. The development of yellow birch regeneration on scarified sites. Can. Dept. For. Rural Devel., For. Br., Ottawa, ON. Dept. Publ. No. 1210. 14 pp.

2.11.1 Scarification strips to regenerate yellow birch

Study pseudonyms	Haliburton Forest; Kennesis Lake; Project H-107
Study instigator	J. Jarvis
Associated staff	G. Cunningham
Current contact	Peter Schleifenbaum
Abstract	This study's design and treatment schedule was identical to Scarification Blocks to Regenerate Yellow Birch (2.10.1), except that scarification was done by strips due to the presence of sugar maple saplings, established following the harvest 10 years earlier. Scarified strips were hand-seeded with yellow birch due to a poor seed year. The trial was abandoned by 1960 as a result of poor stocking to yellow birch caused by heavy rabbit browsing.
Objectives	To determine whether heavy cutting and site preparation (in strips) at the time of logging will improve stocking of yellow birch. To determine whether yellow birch seedlings will form a dominant component of the new stand if provided adequate growing space.
Layout/design	Area consists of 4, 10-acre (4 ha) sections: 2 (A and C) were chosen at random for treatment (logged and scarified with a D-6 caterpillar tractor with a straight-edged blade); 2 (B and D) were reserved for controls (logged only). Seventy-five 0.01-acre (0.004 ha) plots were established, each subdivided into 10 milliacre (4 m^2) quadrants that were randomly located and tallied.
Comments	
Activity	4 Inactive Unavailable–data wholly or partially lost
Quality	5 Unknown
Stability	4 Very Unstable–obsolete format/missing or damaged hard copy
Silvicultural treatments	harvest cut; seeded manually; site preparation
Measurements	crown closure (%); browse damage; height; regeneration tally; soil moisture
Map types	
Establishment year	1955
Measurement years	1956; 1957; 1960
Treatment years	1955
Future measurement years	none scheduled
Scheduled treatment years	none scheduled

Study sites	Property	Value
Haliburton County, south of Kennesis Lake	Latitude	45 / 11
	Longitude	78 / 36
	Radius	250 m
	Site class	2
	Species	yellow birch
	Type	plot

Data location	Property	Value
Great Lakes Forestry Centre–CFS	Analog formats	paper map(s)

Publications

von Althen, F.W. 1983. Animal damage to hardwood regeneration and its prevention in plantations and woodlots of southern Ontario. Can. Dept. Env., Can. For. Serv., Grt. Lks. For. Res. Cent., Sault Ste. Marie, ON. Inf. Rep 0-X-351. 28 pp.

2.12.1 Establishment of yellow birch

Study pseudonyms	Goulais River Research Area ; Project 0-7	
Study instigator	Ben Wang	
Associated staff	N/A	
Current contact	Steve D'Eon	
Abstract	In an effort to obtain yellow birch regeneration, a tolerant hardwood stand was selection harvested and site prepared. Earlier the stand had been lightly cutover (high-graded). Four treatment combinations were applied: scarified (bulldozer), unscarified, artificial seeding, natural seeding. Canopy density was measured (moosehorn) and where necessary further reduced to 40-50% light availability by girdling/chemical treatment of understory trees.	
Objectives	To test the influence of seedbed condition and canopy density on height growth of yellow birch.	
Layout/design	A split-plot design was used incorporating 6 blocks, each containing 4 plots. Each plot is a treatment combination with 12 to 16 milliacre (4 m^2) quadrants (depending on the size of block). Data were collected for 82 tagged yellow birch seedlings for 2 years on 52 randomly selected milliacre (4 m^2) quadrants.	
Comments		
Activity	3 Inactive Available–data set static/available	
Quality	3 Fair	
Stability	3 Moderately Unstable–obsolete format/poor hard copy	
Silvicultural treatments	girdling; harvest cut; seeded manually; site preparation	
Measurements	crown closure (%); regeneration tally; soil moisture; soil textures	
Map types	custom site map; plot map	
Establishment year	1961	
Measurement years	1962; 1963	
Treatment years	1961	
Future measurement years	none scheduled	
Scheduled treatment years	none scheduled	
Study sites	**Property**	**Value**
Goulais River Research Area (Main Block)	Latitude	46 / 55
	Longitude	83 / 58
	Radius	75 m
	Site class	2
	Species	yellow birch
	Type	plot
Data location	**Property**	**Value**
Great Lakes Forestry Centre–CFS	Analog formats	paper map(s)

Publications

Burton, D.H., Anderson, H.W., Riley, L.F. 1969. Natural regeneration of yellow birch in Canada. Pp. 55-73 *in* Proc. Birch Symposium, Aug. 19-21, 1969, Univ. New Hampshire, Durham, NH. USDA For. Serv., Northeast For. Exp. Stn., Upper Darby, PA. 183 pp.

Wang, B.S.P. 1965. Seedbed, canopy and moisture effects on growth of yellow birch seedlings. For. Chron. 41(1): 106-107.

2.13.1 Operational site preparation for yellow birch regeneration

Study pseudonyms	Flyingfisher Lake; Stubby Lake; Yellow birch clumping; Yellow birch seedling transects
Study instigator	G.A. Sinclair
Associated staff	Harvey Anderson
Current contact	William Cole
Abstract	This trial was established in Algonquin Park by Lindsay District staff. Heavy scarification work done by bulldozers augmented site preparation that occurred from skidding operations during the harvest. Provincial researchers were asked to evaluate regeneration results.
Objectives	To evaluate heavy scarification treatment as a means of creating favourable microsites for yellow birch establishment.
Layout/design	Twelve transect lines with a total sampling area of 0.8 ha.
Comments	Study demonstrated need to limit duff removal during site preparation to acquire optimal regeneration.
Activity	3 Inactive Available–data set static/available
Quality	3 Fair
Stability	3 Moderately Unstable–obsolete format/poor hard copy
Silvicultural treatments	harvest cut; site preparation
Measurements	basal area; height; regeneration tally; stocking
Map types	custom site map; sketch
Establishment year	1957
Measurement years	1957; 1958; 1959; 1960; 1971
Treatment years	1957
Future measurement years	none scheduled
Scheduled treatment years	none scheduled

Study Sites

Bruton township, Conc. 12-13, Lot 2-3, 8-10

Property	Value
Latitude	45 / 17
Longitude	78 / 18
Radius	2.2 km
Site class	1
Species	yellow birch
Type	transect

Data location

OFRI–MNR (And.)

Property	Value
Analog formats	original tally sheets
Analog formats	paper map(s)
Digital formats	Apple soft

Publications

McEwen, J.G.K., Burton, D.H., Sinclair, G.A. 1958. A description and evaluation of cultural treatments in the tolerant hardwoods stands of the Lindsay district. Ont. Dept. Lands For., Maple, ON. For. Sect. Rep. No. 19. 13 pp.

2.14.1 Regeneration tally of yellow birch

Study pseudonyms	Crozier Lake; Lower Fletcher Lake; McFadden Lake; Yellow birch clumping	
Study instigator	Harvey Anderson	
Associated staff	N/A	
Current contact	William Cole	
Abstract	The original intent of this study was to evaluate methods of establishing yellow birch regeneration. Later the developing stand was used to study optimal height/diameter (slenderness) ratios and the process of self-pruning.	
Objectives	To evaluate success of treatments used to artificially regenerate yellow birch. To investigate yellow birch characteristics related to height/diameter relationships and self pruning.	
Layout/design	Contains 25, 18-m radius, plots.	
Comments	Compliments Yellow Birch Recruitment study (2.02.1) at Swan Lake.	
Activity	3 Inactive Available–data set static/available	
Quality	1 Excellent	
Stability	3 Moderately Unstable–obsolete format/poor hard copy	
Silvicultural treatments	harvest cut; manual scarification; seeded manually; site preparation	
Measurements	DBH; height; regeneration tally; stem map	
Map types	custom site map; sketch	
Establishment year	1962	
Measurement years	1962; 1963	
Treatment years	1958	
Future measurement years	none scheduled	
Scheduled treatment years	none scheduled	
Study sites	**Property**	**Value**
McClintock Twp, Conc.7, Lots 16-17	Latitude	45 / 20 / 30
	Longitude	78 / 50 / 30
	Radius	120 m
	Site class	2
	Species	yellow birch
	Type	polar plot
Data Location	**Property**	**Value**
OFRI–MNR (And.)	Analog formats	original tally sheets
	Analog formats	paper map(s)
	Digital formats	Apple soft

Publications

Anderson, H.W., Batchelor, B.D., Corbett, C.M., Deugo, D.T., Husk, C.F., Wilson, W.R. 1990. A silvicultural guide for the tolerant hardwood working group in Ontario. Ont. Min. Nat. Resour., Toronto, ON. Sci. Technol. Ser. Vol. 7. 178 pp.

Bruce, D.S., Heeney, C.J. 1977. A silvicultural guide to the hard maple, yellow birch, and hemlock working group in Ontario., Ont. Min. Nat. Resour. Maple, ON. 50 pp.

Ontario Ministry of Natural Resources. 1998. A silvicultural guide for the tolerant hardwood forest in Ontario, Ver. 1.1. Ont. Min. Nat. Resour., Toronto, ON. 500 pp.

2.15.1 Yellow birch regeneration cuts

Study pseudonyms	Mulock Operating Block; Mulock strip cuts
Study instigator	Unknown
Associated staff	Brian Batchelor; Bill Rose
Current contact	Guylaine Thauvette
Abstract	Many trials were initiated in this large block comprising mature and overmature hardwoods to evaluate harvest and renewal treatments for yellow birch and to serve as a demonstration area. Strip cutting was the most widespread harvesting method. Follow up treatments included felling unmerchantable trees, girdling, scarifying and planting (white pine, white spruce, red spruce). Under certain conditions, strip shelterwood successfully regenerated yellow birch.
Objectives	To promote yellow birch regeneration. To assess three harvest methods: circular plots, 12" diameter limit, and strip shelterwood.
Layout/design	Total area of 2,002 ha was subdivided into 5 blocks (approximately 405 ha each); no evidence of control plots.
Comments	Report suggests that an intensive survey be conducted to examine the quantity and quality of yellow birch regeneration and to correlate this with treatment data. Report contains a list of data to collect if this experiment is to continue.
Activity	3 Inactive Available–data set static/available
Quality	3 Fair
Stability	3 Moderately Unstable–obsolete format/poor hard copy
Silvicultural treatments	girdling; harvest cut; planting; manual scarification; site preparation; strip cut; tending
Measurements	tree age; basal area; height; regeneration tally; soil textures; volume yields
Map types	custom site map; plot map
Establishment year	1954
Measurement years	1954; 1961
Treatment years	1956; 1958; 1959; 1962; 1965; 1966; 1967; 1969; 1978
Future measurement years	none scheduled
Scheduled treatment years	none scheduled

Study sites	Property	Value
Mulock township off Mulock Road	Latitude	46 / 28
	Longitude	79 / 18
	Radius	1.8 km
	Site class	1
	Site class	2
	Site class	3
	Species	yellow birch
	Type	plot

Data location	Property	Value
North Bay District–MNR	Analog formats	paper map(s)
	Analog formats	photocopied sheets
SSI (North Bay)-MNR	Analog formats	original tally sheets
	Analog formats	paper map(s)

Publications

Ontario Ministry of Natural Resources. 1989. Report on the Mulock operating block. Ont. Min. Nat. Resour., North Bay, ON. 23 pp.

2.16.1 Yellow birch permanent sample plots for regeneration assessment

Study pseudonyms	Blind River; Demorest Lake Road; Williamson Lake Road
Study instigator	Gord Campbell
Associated staff	N/A
Current contact	William Cole
Abstract	During the late 1970s, a series of PSPs were established in the Blind River District to assess the yellow birch regeneration resulting from strip cutting. A straight blade was used for site preparation and areas were planted with yellow birch. The PSP in Juillette Twp was destroyed by a skidder.
Objectives	To evaluate effectiveness of strip cutting and artificial renewal practices.
Layout/design	Each plot was 1 m x 10 m (10, 1 x 1m subplots); no control plots.
Comments	A 1977 project plan and a 1989 summery report can be found in the Montgomery Twp binder.
Activity	3 Inactive Available–data set static/available
Quality	2 Good
Stability	3 Moderately Unstable–obsolete format/poor hard copy
Silvicultural treatments	planting; site preparation; strip cut
Measurements	height; regeneration tally; soil textures
Map types	aerial photograph; custom site map; OBM; sketch
Establishment year	1977; 1978;
Measurement years	1978; 1979; 1980; 1981; 1982; 1984; 1985; 1986; 1989
Treatment years	1976; 1977; 1978; 1979
Future measurement years	none scheduled
Scheduled treatment years	none scheduled

Study sites	**Property**	**Value**
Montgomery, Nouvel, Parkinson, Varley & Juillette	Latitude	46 / 25
	Longitude	83 / 20
	Radius	30 km
	Site class	2
	Site class	3
	Species	yellow birch
	Type	plot
	Type	polar plot

Data location	**Property**	**Value**
OFRI–MNR	Analog formats	aerial photographs
	Analog formats	original tally sheets
	Analog formats	paper map(s)
	Analog formats	photocopied sheets
	Analog formats	photographs

Publications

None

2.17.1 Yellow birch manual seeding in site prepared strip cuts

Study pseudonyms	Blind River; yellow birch seeding test plots	
Study instigator	Gord Campbell	
Associated staff	N/A	
Current contact	William Cole	
Abstract	Plots were located within an area that had been strip cut and then site prepared by either a root rake or straight blade. Within each strip, 2 plots (1 with humus and 1 with mineral soil exposure) were hand seeded with yellow birch seed.	
Objectives	To compare germination, survival, and growth of yellow birch seed on humus versus bare mineral soil following harvesting and site preparation by straight blade versus root rake.	
Layout/design	Twenty 1 x 1m plots were located in strip cuts: 10 in root rake area and 10 in straight blade.	
Comments	Plots were identified with pins.	
Activity	4 Inactive Unavailable–data wholly or partially lost	
Quality	5 Unknown	
Stability	4 Very Unstable–obsolete format/missing or damaged hard copy	
Silvicultural treatments	seeded manually; site preparation; strip cut	
Measurements	crown closure (%); regeneration tally; soil textures	
Map types	custom site map; plot map	
Establishment year	1981	
Measurement years	1982; 1983; 1984	
Treatment years	1981	
Future measurement years	none scheduled	
Scheduled treatment years	none scheduled	
Study sites	**Property**	**Value**
Juillette Twp, south of Matinenda Lake	Latitude	46 / 25
	Longitude	83 / 20
	Radius	10 km
	Site class	2
	Species	yellow birch
	Type	plot
Data location	**Property**	**Value**
OFRI–MNR	Analog formats	paper map(s)
	Analog formats	photocopied sheets

Publications

None

2.18.1 Mechanical site preparation for yellow birch regeneration

Study pseudonyms	Bracebridge rake	
Study instigator	Dave Deugo	
Associated staff	Andy Mutchmor	
Current contact	Gord Campbell	
Abstract	Recognizing the need for light mechanical site preparation but concerned about excessive disturbance from straight blades and Eden rakes, a new design for a small portable rake that could be mounted on a D3-sized tractor for good maneuverability in shelterwood stands was developed. The new attachment, known as the Bracebridge Rake, featured up to 9 removable teeth to allow teeth to be adjusted to site conditions. A unique hinge design allowed the blade to swing forward and upward to ease riding over stumps and logs when reversing. The Bracebridge Rake was shown to be effective for providing seedbed conducive to yellow birch germination and initial establishment and for reducing average percent cover of competitive shrubs in the understory.	
Objectives	To determine the difference in rates of natural yellow birch germination on raked versus non-prepared seedbeds following a good yellow birch seed crop forecast.	
Layout/design	A t-test for paired plots was used to compare differences in germination rates between the treatments (Bracebridge Rake versus control, no site preparation following the shelterwood harvest). Twelve randomly located plot pairs were installed and assessed.	
Comments		
Activity	5 Unknown	
Quality	5 Unknown	
Stability	5 Unknown	
Silvicultural treatments	shelterwood; site preparation	
Measurements	crown closure (%); basal area; height; regeneration tally; soil textures	
Map types		
Establishment year	1991	
Measurement years	1992; 1993; 1994; 1995	
Treatment years	1991	
Future measurement years	none scheduled	
Scheduled treatment years	none scheduled	
Study sites	**Property**	**Value**
Armour Twp	Site class	1
	Species	yellow birch
	Type	plot
Data location	**Property**	**Value**
Bracebridge Area Office–MNR	Analog formats	unknown
SSI (North Bay)-MNR	Analog formats	unknown

Publications

Mutchmor, A.F. 1993. Using prescribed fire to manage red oak and yellow birch in the central region of Ontario. Ont. Min. Nat. Resour., Ont. For. Res. Inst., Sault Ste Marie, ON. VMAP Rep. 2(1): 3-6.

2.19.1 Relationship of season of strip cutting to quantity of natural yellow birch and sugar maple regeneration

Study pseudonyms	Blind River	
Study instigator	Gord Campbell	
Associated staff	N/A	
Current contact	Gord Campbell	
Abstract	Quality and stocking percent of yellow birch and sugar maple regeneration were evaluated in strip clearcuts harvested in summer to early fall, fall, and winter. Results indicate that regardless of season, harvesting alone did not create a suitable seedbed for substantial yellow birch regeneration. Fall harvesting provided the best yellow birch regeneration and winter logging the worst, due to the high proportion of hard maple seedlings that regenerated. Additional site preparation is recommended.	
Objectives	To determine the most appropriate season of logging to promote yellow birch regeneration.	
Layout/design	Series of sample plots were used to assess the treatments.	
Comments		
Activity	4 Inactive Unavailable–data wholly or partially lost	
Quality	3 Fair	
Stability	3 Moderately Unstable–obsolete format/poor hard copy	
Silvicultural treatments	Strip cut	
Measurements	crown closure (%); regeneration tally	
Map types	custom site map	
Establishment year	1979	
Measurement years	1980; 1981; 1982	
Treatment years	1976; 1977; 1978	
Future measurement years	none scheduled	
Scheduled treatment years	none scheduled	
Study sites	**Property**	**Value**
Parkinson township northeast of Woodrow Lake	Latitude	46 / 25
	Longitude	83 / 20
	Radius	10 km
	Site class	2
	Site class	3
	Species	sugar maple
	Species	yellow birch
	Type	plot
Data location	**Property**	**Value**
Blind River Area Office–MNR	Analog formats	unknown
SSI (North Bay)-MNR	Analog formats	paper map(s)

Publications

Watson, N.F. 1985. An evaluation of yellow birch and hard maple regeneration, in strip clear cuts of Parkinson Township, to determine an optimum season of harvest. For. Dept., Lakehead Univ., Thunder Bay, ON. B.Sc.F. Thesis. 45 pp.

2.20.1 Effect of deer browsing on yellow birch regeneration using three methods of assessing impact

Study pseudonyms	Algonquin Park ; Bouillon Lake south
Study instigator	A.B. Stephenson
Associated staff	N/A
Current contact	Dennis Voigt
Abstract	The investigation included both an aerial and ground survey to determine: the distribution of deer in relation to the scarified area, the area's deer population, the stand composition and degree of scarification, the amount of yellow birch regeneration on the scarified patches, and the effect of deer browsing on yellow birch regeneration.
Objectives	To determine the effect of deer browsing on yellow birch regeneration
Layout/design	Study has 3 components: (1) aerial reconnaissance, (2) deer pellet group count (74, 0.01 acres (0.004 ha) plots (66 x 6.6 feet; 20.1 x 2 m) located along transect lines to sample deer activity, and (3) 2 deer exclosures and associated control (adjacent area with no fencing).
Comments	
Activity	4 Inactive Unavailable–data wholly or partially lost
Quality	2 Good
Stability	4 Very Unstable–obsolete format/missing or damaged hard copy
Silvicultural treatments	patch cut; site preparation
Measurements	crown closure (%); browse damage
Map types	custom site map; sketch
Establishment year	1956
Measurement years	1957
Treatment years	1957
Future measurement years	none scheduled
Scheduled treatment years	none scheduled

Study sites	**Property**	**Value**
Biggar township, NW corner of Algonquin Park	Latitude	45 / 54
	Longitude	78 / 54
	Radius	800 m
	Site class	1
	Site class	2
	Species	sugar maple
	Species	yellow birch
	Type	plot
	Type	transect

Data location	**Property**	**Value**
OFRI–MNR	Analog formats	paper map(s)

Publications

Anderson, H.W., McLean, M.M. 1960. Effects of animal damage on forest tree regeneration: A discussion presented to the Third Annual Sportsmen's Conservation Workshop at Swan Lake, September 11, 1960. Ont. Dept. Lands For., Res. Br., Maple, ON. Unpubl. Rep., 9 pp.

Stephenson, A.B. 1958. The effect of deer on yellow birch in Biggar Township, Algonquin Park. Ont. Dept. Lands For., Res. Br., Maple, ON. Wildl. File Rep. 50. 14 pp.

Voigt, D.R. 1992. White-tailed deer habitat in Ontario: Background to guidelines. Ont. Min. Nat. Resour., Wildl. Policy Br., Toronto, ON. 5 pp.

2.21.1 Effect of deer browsing on yellow birch regeneration using deer exclosures

Study pseudonyms	Crozier Lake; Deer study; Lower Fletcher Lake; Swan Lake Forest Research Reserve
Study instigator	A.B. Stephenson
Associated staff	Harvey Anderson; R. Hepburn
Current contact	Dennis Voigt
Abstract	This study was initiated following logging and site preparation to create favourable conditions for yellow birch regeneration. Deer exclosures and adjacent control areas were used to provide insight into the impact of deer on yellow birch regeneration.
Objectives	To provide information about the effects of browsing on height growth of yellow birch at various deer population levels.
Layout/design	Four fenced and 4 unfenced (control) plots were established at both sites (Swan Lake and Crozier Lake). Each plot was 40 x 40 feet (12.2 x 12.2 m); 230 plots of browse surveys and 800 plots of pellet surveys were conducted.
Comments	At Swan Lake, deer exclosures were located within the 1953 Yellow Birch Patch Dynamics study (2.01.1).
Activity	3 Inactive Available–data set static/available
Quality	2 Good
Stability	3 Moderately Unstable–obsolete format/poor hard copy
Silvicultural treatments	fenced off; manual scarification; single-tree selection
Measurements	browse damage; height; regeneration tally
Map types	custom site map; sketch; Swan Lake GIS–locations approximate
Establishment year	1954
Measurement years	1954
Treatment years	1953; 1954
Future measurement years	none scheduled
Scheduled treatment years	none scheduled

Study sites	Property	Value
Crozier or Lower Fletcher Lake	Latitude	45 / 21
	Longitude	78 / 51
	Radius	140 m
	Site class	2
	Species	yellow birch
	Type	plot
Swan Lake Reserve	Latitude	45 / 29 / 35
	Longitude	78 / 43 / 34
	Radius	110 m
	Site class	2
	Species	yellow birch
	Type	plot

Data location	Property	Value
OFRI–MNR	Digital formats	Swan Lake GIS
Peterborough–MNR	Analog formats	paper map(s)

Publications

Anderson, H.W., McLean, M.M. 1960. Effects of animal damage on forest tree regeneration: A discussion presented to the Third Annual Sportsmen's Conservation Workshop at Swan Lake, September 11, 1960. Ont. Dept. Lands For., Res. Br., Maple, ON. Unpubl. Rep., 9 pp.

Stephenson, A.B. 1958. The effect of deer on yellow birch regeneration: Progress report for 1956-57. Ont. Dept. Lands For., Res. Br., Maple, ON. Wildl. File Rep. 58. 36 pp.

2.22.2 Yellow birch and sugar maple thinning

Study pseudonyms	Algoma District; Axe Lake east; Blind River; Thessalon
Study instigator	Fred von Althen
Associated staff	Fred Foreman
Current contact	Gord Campbell
Abstract	The original stand, dominated by mature sugar maple and yellow birch, was highgraded in 1938-39 and again in 1961-63. Alternate strips, approximately 20 m wide, were clearcut in a north-south direction in 1965-66. Leave strips of the same width were partially logged to preserve seed trees. Following logging, all remaining trees were felled in the clearcut corridors and the soil was scarified to promote yellow birch regeneration. Twenty years after logging, the clearcut strips are densely regenerated with up to 8,800 stems per ha of mainly yellow birch and sugar maple. Release at a 3-m radius (30% level) provided good balance between diameter increment and stem quality maintenance (clear bole length and amount of large epicormic branches) for both species.
Objectives	To demonstrate the effects of different thinning intensities in 25-year-old stands of yellow birch and sugar maple.
Layout/design	Sixty-seven ha site divided into 15 blocks. Of the 8 blocks for yellow birch thinning, 2 blocks each were at 10%, 20%, and 30% levels and 1 block at 40% and 1 control block. For the 7 hard maple blocks, 2 blocks each were at 10%, 20%, and 30% levels and 1control block. No randomization of treatments was attempted because a crew inexperienced in hardwood thinning carried out the cutting. Although not suitable for conventional statistical analysis, the 30 crop trees evaluated in each treatment block provided a suitable database with which to demonstrate treatment effects.
Comments	
Activity	3 Inactive Available–data set static/available
Quality	2 Good
Stability	2 Moderately Stable–current format/hard copy
Silvicultural treatments	improvement cut; strip cut
Measurements	crown size; live/dead status; DBH; height; soil nutrient analysis; soil textures; stocking
Map types	aerial photograph; plot map
Establishment year	1986
Measurement years	1987; 1991; 1992; 1993
Treatment years	1966; 1987
Future measurement years	none scheduled
Scheduled treatment years	none scheduled

Study sites	Property	Value
Gould township	Latitude	46 / 30
	Longitude	83 / 25
	Radius	500 m
	Site class	2
	Site class	3
	Species	sugar maple
	Species	yellow birch
	Type	plot

Data location	Property	Value
Blind River Area Office–MNR	Analog formats	aerial photographs
	Analog formats	paper map(s)
Great Lakes Forestry Centre–CFS	Analog formats	photocopied sheets

Publications

Fox, B., White, K., Nichols, J. 1991. Silvicultural demonstration areas of the Kirkwood forest. Ont. Min. Nat. Resour., Central Ont. For. Technol. Devel. Unit. North Bay, ON. 22 pp.

Wood, J.E., von Althen, F.W., Mitchell, E.G. 1996. Crown release improves growth of 20-year-old *Betula alleghaniensis* in tolerant northern hardwood stands. New For. 12: 87-99.

3.01.1 Red oak establishment under white pine overstory

Study pseudonyms	Headquarters silvicultural area; Prescribed burn for white pine regeneration; Project P-242
Study instigator	Unknown
Associated staff	Steve D'Eon
Current contact	Craig Robinson
Abstract	An experiment to renew white pine using a prescribed burn under a white pine overstory has resulted in excellent stocking of red oak saplings.
Objectives	unknown
Layout/design	unknown
Comments	
Activity	5 Unknown
Quality	5 Unknown
Stability	5 Unknown
Silvicultural treatments	prescribed burn; Seed tree cut
Measurements	N/A
Map types	custom site map; sketch
Establishment year	unknown
Measurement years	unknown
Treatment years	unknown
Future measurement years	none scheduled
Scheduled treatment years	none scheduled

Study sites	Property	Value
Petawawa Research Forest/Headquarters Silv.	Latitude	45 / 58
	Longitude	77 / 31
	Species	eastern white pine
	Species	northern red oak

Data location	Property	Value
Petawawa Research Forest	Analog formats	paper map(s)

Publications

None

3.02.1 Establishing regeneration under a young red pine plantation utilizing different silvicultural techniques (incl. planting)

Study pseudonyms Compartments 20b &21b Norton tract Durham Regional Forest; Experiment A; Managing natural succession in conifer plantations

Study instigator Dan Dey

Associated staff Eric Boysen

Current contact Ken Elliott

Abstract Given adequate seed source and disturbance (thinnings or shelterwood cuttings), red pine plantations will succeed to forest conditions more typical of what existed at the time of pre-European settlement. Patch clearing, coppicing of advanced regeneration, and supplementary artificial regeneration will encourage earlier regeneration, improve stocking, increase vigour, diversify species composition, improve stand quality, and accelerate ecological restoration of the site.

Objectives

To determine the most effective overstory disturbance patterns and thinning regimes to promote desirable regeneration.
To determine the critical regeneration stocking and density levels required to advance tree succession.
To determine the effectiveness of supplemental planting or seeding.
To determine effective management techniques to release established regeneration and to develop healthy, high quality trees.
To determine the change in soil nutrient composition over the period of conversion from conifer plantation to "natural forest."
To determine species diversity changes over the conversion period.

Layout/design

Main experimental area is Compartment 20b with a small additional area in Compartment 2 b. Main area is 158 m (79 rows) by 120 m. This 1.9 ha block was further subdivided into 20 smaller blocks approximately 32 m (16 rows) by 30 m (north-south distance). An additional 0.4 ha was divided into 4 blocks with the same dimensions as those in the main block.
Harvesting: Four replications of each of the following treatments were randomly assigned to the 20 blocks:

i) No Treatment, Block C–Control leaving a relative density (RD) of 0.69 (this was the precut condition for the entire stand),
ii) Row Removals, Block A–4th row removal (25% of overstory removed) to residual RD=0.51; further selection thinning in 5 to 10 years to residual RD= 0.40; Block D–cut 2 rows leave 3 rows (40% of overstory removed) leaving residual RD=0.41,
iii) Selection Removal, Block B–4th row removed + selective removal of trees in the remaining three rows (44% of overstory removed) leaving a residual RD=0.39
iv) Patch Clearing, Blocks E, F–100% overstory removal in circular openings that have a diameter of 1m (1/2 the average overstory tree height). There will be one opening within the centre of each block. The area surrounding the opening will be thinned based on Block B prescription. RD=0.39 (4th row removal will provide access to openings)

Artificial regeneration tally:
Each of the 20 treatment blocks in the main study area will halved on an east/west line. The south half of each block will receive a supplementary treatment of planted seedlings and seeding. Four east/west rows (crossing the thinning treatments) will be established at 3-m spacing between rows. The northern-most row will be planted to 25 white pine seedlings spaced at 1.2 m. The next row to the south will be planted to 25 red oak seedlings spaced at 1.2 m. The third row will be planted to 25 white ash seedlings spaced at 1.2 m. The fourth row will have 25 spots seeded to red oak acorns at 1.2 m. Five acorns will be placed at each seeding spot. To assess how the patch openings affect artificial regeneration, 4 more patches will be established in Compartment 21b in the same way as those in Block E and this additional treatment will be known as Block F. Each patch will be planted to 5 seedlings of each of white pine, white ash, and red oak plus 5 red oak seeding spots with 5 acorns each.

Comments	Survival and development of planted stock to be monitored 5 to 10 years following the treatment (1999-2004). Area to be assessed for future thinning.	
Activity	2 Active Irregular–data set irregularly updated and maintained	
Quality	1 Excellent	
Stability	1 Very Stable–current format/hard copy/backed up/annotated	
Silvicultural treatments	patch cut; planting; thinning	
Measurements	crown closure (%); basal area; DBH; height; regeneration tally; soil textures; volume yields	
Map types	custom site map; district map; sketch	
Establishment year	1993	
Measurement years	1993; 1994	
Treatment years	1994	
Future measurement years	none scheduled	
Scheduled treatment years	none scheduled	
Study sites	**Property**	**Value**
Durham County, Uxbridge Twp, Conc. IV, Lot 15	Latitude	44 / 03
	Longitude	79 / 10
	Radius	80 m
	Site class	1
	Site class	2
	Species	northern red oak
	Species	white ash
	Type	plot
Data location	**Property**	**Value**
Ont. For. Res. Inst.- MNR	Analog formats	computer printouts
	Analog formats	paper map(s)
	Digital formats	Hardwood Archive
Southcentral Sci. & Info. (North Bay)- MNR	Digital formats	Hardwood Archive

Publications

Ontario Ministry of Natural Resources. 2000. A silvicultural guide to managing southern Ontario forests, Ver 1.1. Ont. Min. Nat. Resour., Toronto, ON. 648 pp.

Parker, W.C., Elliott, K.A., Dey, D.C., Boysen, E.P., Newmaster, S.G. 2001. Managing succession in conifer plantations: Converting young red pine (Pinus resinosa Ait.) plantations to native forest types by thinning and underplanting. For. Chron. 77(4): 721-734.

3.03.1 Management of existing natural regeneration under an overstory of red pine

Study pseudonyms Compartment 27a main tract Durham Regional Forest; Experiment B; Managing natural succession in conifer plantations

Study instigator Dan Dey

Associated staff Eric Boysen

Current contact Ken Elliot

Abstract Successional processes will eventually restore red pine plantations to a forest condition more typical of pre-European settlement. Red pine plantations that have adequate hardwood seed sources and receive thinning or shelterwood cuttings will advance. Patch clearing, coppicing of advanced regeneration, and supplementary artificial regeneration will encourage earlier regeneration, improve stocking, increase vigour, diversify species composition, improve stand quality, and accelerate ecological restoration of the site.

Objectives

To determine the most effective overstory disturbance patterns and the thinning regimes that promote desirable regeneration.

To determine the critical regeneration stocking and density levels required to advance the succession of trees.

To determine effective management techniques to release established regeneration and to develop healthy, high quality trees.

To determine the change in soil nutrient composition over the period of conversion from conifer plantation to "natural forest."

To determine species diversity changes over the conversion period.

Layout/design

Area divided into a grid system of 28 blocks approx. 4.8 ha; resulting blocks (43 m (12 red pine rows) by 40 m) were assessed and stratified by site conditions, 4 replications were identified and each of the 7 treatments were randomly assigned to each of the 4 zones or replications:

No Treatment:
Treatment 1–Control: No further treatment

Uniform Shelterwood Removals:
Treatment 2–Normal uniform shelterwood with no understory treatment: This treatment was considered a regeneration cut in the shelterwood system. The removal of individually selected overstory red pine trees will encourage regeneration by creating uniform spacing (5 to 6 m) while aiming for approximately 40% full sunlight (22 to 24 m2/ha of basal area). All sound white pine that are not causing access problems were left as seed trees. Pole quality material was removed.
Treatment 3–Normal uniform shelterwood with an understory coppice treatment: Same overstory treatment as Treatment 2. Within the centre of each treatment block a 15-m radius circle will be identified for a brush saw treatment to cut understory vegetation to ground level. This will allow a 5+m buffer on the outside of the treated circle to help eliminate edge effects.

Group Shelterwood Removals:
Treatment 4–Small canopy gap with no understory coppice treatment: All the overstory red and white pine trees will be removed from a 15-m diameter, circular patch (approx. half the average stand height) within the centre of each treatment block. These canopy gaps will provide close to 100% full sunlight to the natural regeneration in the centre of the patch.
Treatment 5–Small canopy gap with an understory coppice treatment: Overstory treatment same as Treatment 4 and understory treatment same as Treatment 3.
Treatment 6–Large canopy gap with no understory coppice treatment: All overstory red and white pine trees will be removed from a 24-m diameter, circular patch (a few m less than the average stand height) within the centre of each treatment block. These canopy gaps will provide close to 100% full sunlight to the natural regeneration in the centre of the patch.
Treatment 7–Large canopy gap with an understory coppice treatment: Overstory treatment same as Treatment 6 and the understory treatment same as Treatment 3.

Comments	Between 2002 and 2009, area is to be assessed for future silvicultural treatments.	
Activity	2 Active Irregular–data set irregularly updated and maintained	
Quality	1 Excellent	
Stability	1 Very Stable–current format/hard copy/backed up/annotated	
Silvicultural treatments	patch cut; thinning	
Measurements	crown closure (%); tree age; basal area; DBH; height; regeneration tally; soil textures	
Map types	custom site map; district map; sketch	
Establishment year	1993	
Measurement years	1993; 1994	
Treatment years	1994; 1995	
Future measurement years	see comments	
Scheduled treatment years	none scheduled	
Study sites	**Property**	**Value**
Durham County, Uxbridge Twp, Conc. VII, lot 15	Latitude	44 / 04
	Longitude	79 / 05
	Radius	120 m
	Site class	1
	Site class	2
	Species	northern red oak
	Species	red pine
	Type	plot
Data location	**Property**	**Value**
Ont. For. Res. Inst.- MNR	Analog formats	original tally sheets
	Analog formats	paper map(s)
	Analog formats	photocopied sheets
	Digital formats	Hardwood Archive
Southcentral Sci. & Info. (North Bay)-MNR	Digital formats	Hardwood Archive

Publications

Ontario Ministry of Natural Resources. 2000. A silvicultural guide to managing southern Ontario forests, Ver 1.1. Ont. Min. Nat. Resour., Toronto, ON. 648 pp.

3.04.1 Red oak artificial establishment in openings in red pine plantations

Study pseudonyms	Hendrie Tract; Huronia; Midhurst
Study instigator	George Stroempl
Associated staff	N/A
Current contact	Ed Sutherland
Abstract	Planting of red oak seedlings in openings resulted in good survival, height growth, and stem quality after 10 years in a mature red pine plantation. Although survival was equally high in all openings, height growth was significantly less in the smaller openings, probably due to lower light intensities. Repeated rodent girdling or clipping and deer browsing to oak during early years were the main causes of damage limiting the number of good trees and the recovery of their crowns or resprouting. This study illustrates that red oak planted in red pine plantation openings will survive and grow well, provided that animal damage is minimized.
Objectives	To test the survival and potential growth of red oak nursery stock planted in openings in a red pine plantation.
Layout/design	Seven plots established in sequence following bearings. Tenth-year data on survival, height, and stem quality of the planted oak was analyzed by the standard t-test at 1% and 5% significance level.
Comments	
Activity	4 Inactive Unavailable–data wholly or partially lost
Quality	3 Fair
Stability	4 Very Unstable–obsolete format/missing or damaged hard copy
Silvicultural treatments	Patch cut; planting
Measurements	crown quality; height; quality class; regeneration tally; soil moisture; soil textures
Map types	custom site map; plot map; sketch
Establishment year	1977
Measurement years	1984; 1987
Treatment years	1977
Future measurement years	none scheduled
Scheduled treatment years	none scheduled

Study sites	**Property**	**Value**
Simcoe County, Vespra Township	Latitude	44 / 25
	Longitude	79 / 44
	Radius	50 m
	Site class	1
	Species	northern red oak
	Type	plot

Data location	**Property**	**Value**
OFRI–MNR	Analog formats	paper map(s)
	Analog formats	photocopied sheets

Publications

Ontario Ministry of Natural Resources. 1983. Untitled. Pp. 25-26 *in* Drysdale, D.P. Ontario Tree Improvement and Forest Biomass Institute: Forest research 1981-1982. Ont. Min. Nat. Resour., Toronto, ON. 42 pp.

Stroempl, G. 1987. Growth and quality of red oak planted in red pine plantation openings. Ont. Min. Nat. Resour., Ont. Tree Improv. For. Biom. Inst., Maple, ON. For. Res. Rep. No. 117. 6 pp.

3.05.1 Prescribed burning to renew red oak stands in Southern Ontario

Study pseudonyms	Dufferin County Forest, main tract, Compartments 27a and 27b; Restoring red oak in southern Ontario; Spring prescribed burn for oak
Study instigator	Dan Dey
Associated staff	Mike Rosen
Current contact	Caroline Mach
Abstract	This study was initiated in recognition that mature red oak stands are regenerating naturally to other more shade tolerant tree species (e.g., sugar maple) and that historically fire played a key in the establishment and maintenance of red oak stands. A low intensity, controlled fire was conducted to remove competing vegetation, followed by a shelterwood harvest.
Objectives	To investigate prescribed burning and shelterwood cutting as techniques for establishing and maintaining red oak components in forest stands. To quantify the relationship between size and age of oak regeneration to survival and growth after burning. To quantify the effects of burning on the survival and growth of competitors of red oak. To expand the knowledge base on burning effects on wildlife habitat.
Layout/design	Four treatments: burned only, shelterwood harvest, burned followed by shelterwood harvest, and control (no treatments). Plots established to study the dynamics of both the understory (including regeneration) and overstory vegetation.
Comments	
Activity	2 Active Irregular–data set irregularly updated and maintained
Quality	1 Excellent
Stability	1 Very Stable–current format/hard copy/backed up/annotated
Silvicultural treatments	prescribed burn; shelterwood
Measurements	crown closure (%); basal area; regeneration tally; soil moisture; soil textures
Map types	custom site map; plot map; sketch
Establishment year	1994
Measurement years	1994; 1995
Treatment years	1994; 1996
Future measurement years	none scheduled
Scheduled treatment years	none scheduled

Study sites	**Property**	**Value**
Dufferin County, Mulmur Twp, Conc.VIII, Lot 17	Latitude	44 / 15
	Longitude	80 / 02
	Radius	150 m
	Site class	1
	Site class	2
	Species	northern red oak
	Type	plot

Data location	**Property**	**Value**
Dufferin County	Analog formats	original tally sheets
	Analog formats	paper map(s)
OFRI–MNR	Analog formats	photocopied sheets
	Digital formats	Hardwood archive

Publications

Kourtz, P. 2002. Red oak prescribed burn expert system. Ont. Min. Nat. Resour., Southcent. Sci. Inf. Sect., North Bay, ON. CD-ROM.

Mach, C. 2000. Case Study: Dufferin County oak prescribed burn. *In* The Ecology, Silviculture and Management of Great Lakes-St. Lawrence Oak: Proceedings of the Your Forest–Your Choice Conference Series, Part 7, Nov. 1-3, 2000, Bracebridge, ON. Westwind For. Steward., Inc. 95 pp.

Ontario Ministry of Natural Resources. 2000. A silvicultural guide to managing southern Ontario forests, Ver 1.1. Ont. Min. Nat. Resour., Toronto, ON. 648 pp.

3.06.1 Repeated prescribed burns for red oak regeneration

Study pseudonyms	Bracebridge red oak trial; Bracebridge Resource Management Centre
Study instigator	Dave Deugo
Associated staff	Andy Mutchmor; Dianne Othmer
Current contact	Andrée Morneault
Abstract	This study illustrates the need for careful applications of prescribed burn treatments to optimize establishment and growth of red oak. It also demonstrates the importance of waiting at least 3 years after seedling establishment before conducting multiple burns, the benefit of overstory thinnings following final burn, and the significance of slope position in determining treatment prescription.
Objectives	To examine the effects of consecutive prescribed burns on the sprouting capacity, survival, and growth of red oak regeneration and the development of other woody vegetation.
Layout/design	Randomized complete block design, blocked on slope position; 4 blocks, 4 treatment plots per block; 4 10 m^2 circular sample subplots per treatment plot. Treatments consisted of prescribed burning in spring of 1992, spring of 1992 and 1993, spring of 1992, 1993, and 1994, and no burning.
Comments	A 1996 windstorm affected some overstory trees within the plots.
Activity	1 Active Regular–data set regularly updated and maintained
Quality	1 Excellent
Stability	1 Very Stable–current format/hard copy/backed up/annotated
Silvicultural treatments	prescribed burn; shelterwood; thinning
Measurements	tree age; height; regeneration tally
Map types	custom site map; sketch
Establishment year	1992
Measurement years	1993; 1994; 1995; 1998; 1999
Treatment years	1990; 1992; 1993; 1994
Future measurement years	none scheduled
Scheduled treatment years	none scheduled

Study sites	**Property**	**Value**
Macaulay Twp, Conc 8 & 9, Lot 9	Latitude	45 / 05
	Longitude	79 / 20
	Radius	150 m
	Site class	1
	Site class	2
	Species	northern red oak
	Type	plot

Data location	**Property**	**Value**
SSI (North Bay)-MNR	Analog formats	original tally sheets
	Analog formats	paper map(s)
	Digital formats	CD-ROM

Publications

Kourtz, P. 2002. Red oak prescribed burn expert system. Ont. Min. Nat. Resour., Southcent. Sci. Inf. Sect., North Bay, ON. CD-ROM.

Morneault, A.E. 2000. BRMC repeated burn oak trials. *In* The Ecology, Silviculture and Management of Great Lakes-St. Lawrence Oak: Proceedings of the Your Forest–Your Choice Conference Series, Part 7, Nov. 1-3, 2000, Bracebridge, ON. Westwind For. Steward., Inc. 95 pp.

Mutchmor, A.F. 1993. Using prescribed fire to manage red oak and yellow birch in the central region of Ontario. Ont. Min. Nat. Resour., Ont. For. Res. Inst., Sault Ste Marie, ON. Veg. Manage. Altern. Pgm. (VMAP) Rep. 2(1): 3-6.

Ontario Ministry of Natural Resources. 1993. Vegetation Management Alternatives Program. Pp. 15-20 *in* Central Region Science and Technology Development Unit: annual report 1992-93. Ont. Min. Nat. Resour., Cent. Ont. Sci. Technol. Devel. Unit, North Bay, ON. 28 pp.

Ontario Ministry of Natural Resources. 1994. Vegetation Management Alternatives Program. Pp. 10-14 *in* Central Region Science and Technology, North Bay: annual report 1993-1994. Ont. Min. Nat. Resour., Cent. Reg. Sci. Technol. Devel. Unit, North Bay, ON. 25 pp.

Wagner, R.G., Buse, L.J., Lautenschlager, R.A., Bell, F.W., Hollstedt, C., Strobl, S., Morneault, A.E., Lewis, W., Ter-Mikaelian, M.T. 1995. Treatment alternatives. Pp. 16-43 *in* Vegetation management alternatives program: 1994-1995 annual report. Ont. Min. Nat. Resour., Ont. For. Res. Inst., Sault Ste. Marie, ON. 99 p.

3.07.1 Regeneration tally of red oak using shelterwood harvest with prescribed burning or manual tending to control competition

Study pseudonyms	Bucke Lake, Pembroke; Cadillac study; Foymount, Pembroke; Papineau Lake, Bancroft; Red oak shelterwood
Study instigator	Dan Dey
Associated staff	Andrée Morneault; Bruce Fleck; William Cole
Current contact	Bill Parker
Abstract	Despite a basic understanding of how to regenerate red oak, we lack detailed information needed to successfully regenerate oak in different ecosystems in Ontario. The oak regeneration potential of many stands is low because oak advance regeneration is low to nonexistent and stems that do exist are small. The key to regenerating oak is to establish adequate numbers of large advanced reproduction before final overstory removal. Oak advance reproduction can occur naturally or be established through artificial regeneration. Oaks have been successfully regenerated in the United States using shelterwood silvicultural systems where understory vegetation was controlled using herbicides. Fire and manual tending may also be used to control competing vegetation in regenerating oak stands.
Objectives	To identify silvicultural practices that build natural populations of large red oak advance regeneration. To develop prescriptions using the shelterwood silvicultural system and underplanting with prescribed fire or herbicide use to regenerate red oak; To evaluate treatment effects for regeneration success for oak forests growing on mesic and xeric sites. To determine optimal timing for final overstory removal. To define characteristics of red oak advanced regeneration. To help identify reproduction that assumes dominance after final overstory removal. To monitor silvicultural treatment effects on non-crop vegetation and plant biodiversity.
Layout/design	Fifty-four plots (60 x 60 m) were randomly assigned 1 of 18 treatment combinations. Within each plot, 10 subplots (1 x 1 m) were used to monitor survival and growth of seedlings Six replications were established (3 in Bancroft, 3 in Pembroke). Sites were underplanted with 2 +0 red oak nursery stock. The study includes: 3 levels of residual shelterwood overstory cover (uncut, 70% residual cover, 50% residual cover); 2 time periods before final overstory removal (3 and 5 years after initial cut); 2 site types (mesic and xeric).
Comments	Planned herbicide treatment was replaced with manual tending. Another study was conducted at the Papineau Lake site: Red oak restoration techniques (3.16.1).
Activity	1 Active Regular–data set regularly updated and maintained
Quality	1 Excellent
Stability	1 Very Stable–current format/hard copy/backed up/annotated
Silvicultural treatments	planting; prescribed burn; shelterwood; tending
Measurements	crown closure (%); basal area; live/dead status; height; regeneration tally
Map types	custom site map; plot map; sketch
Establishment year	1993
Measurement years	1993; 1994; 1995; 1996; 2002
Treatment years	1993; 1995; 1998; 2000
Future measurement years	2003; 2008; 2013
Scheduled treatment years	unknown

Study Sites	Property	Value
Hastings County, ,	Latitude	45 / 20
Bangor Twp	Longitude	77 / 45
Conc.IX&X	Radius	900 m
	Site class	2
	Species	northern red oak
	Type	plot
Renfrew Cty Brudenell	Latitude	45 / 25
Twp Conc.II&III	Longitude	77 / 20
	Radius	800 m
	Site class	2
	Species	northern red oak
	Type	plot
Data location	**Property**	**Value**
OFRI–MNR	Analog formats	original tally sheets
	Analog formats	photographs
	Digital formats	hardwood archive
SSI (North Bay)-MNR	Digital formats	hardwood archive

Publications

Dey, D.C., Parker, W.C. 1996. Regeneration of red oak (*Quercus rubra* L.) using shelterwood systems: Ecophysiology, silviculture and management recommendations. Ont. Min. Nat. Resour., Ont. For. Res. Inst., Sault Ste. Marie, ON. For. Res. Inf. Pap. No. 126. 59 pp.

Fleck, B. 2000. Case study: Bancroft District oak management. *In* The Ecology, Silviculture and Management of Great Lakes-St. Lawrence Oak: Proceedings of the Your Forest–Your Choice Conference Series, Part 7, Nov. 1-3, 2000, Bracebridge, ON. Westwind For. Steward., Inc. 95 pp.

Parker, W.C. 2000. Growth, physiology and shelterwood management of red oak. *In* The Ecology, Silviculture and Management of Great Lakes-St. Lawrence Oak: Proceedings of the Your Forest–Your Choice Conference Series, Part 7, Nov. 1-3, 2000, Bracebridge, ON. Westwind For. Steward., Inc. 95 pp.

3.08.1 Clearcut harvest and two prescribed burns with planting of red oak

Study pseudonyms	Bancroft District; Red oak restoration project; Yuill Lake; Yuill Pond
Study instigator	Bruce Fleck
Associated staff	Dan Dey
Current contact	Andrée Morneault
Abstract	Prescribed fire and planting is used to increase the red oak component in a mixed tolerant-intolerant hardwood forest. Follow up surveys to assess the regeneration and competition on the site indicated that the burns successfully increased the oak component on this site. A change in dominance from a tolerant hardwood to an intolerant and mid-tolerant hardwood occurred in the understory. A later investigation showed that pre-burn vigour and dominance class affects the post-burn height and number of red oak sprouts produced. More sprouts were produced by dominant and co-dominant stems than suppressed stems. More intense fires may reduce the number and height of sprouts. If red oak is released manually, co-dominant stems could respond well and dominant stems could increase by 50%.
Objectives	To convert a white birch-sugar maple dominated stand to red oak. To monitor the response of individual stems to the 1993 prescribed fire.
Layout/design	Nine permanent sample plots established in 1993. Ten semi-permanent clusters established in 2000. Each cluster consists of 8 (2 x 2 m) plots.
Comments	
Activity	2 Active Irregular–data set irregularly updated and maintained
Quality	2 Good
Stability	2 Moderately Stable–current format/hard copy
Silvicultural treatments	clearcut; planting; prescribed burn
Measurements	basal area; height; regeneration tally; stocking
Map types	custom site map; district map; sketch
Establishment year	1985
Measurement years	1986; 1987; 1988; 1991; 2000
Treatment years	1985; 1986; 1987; 1993
Future measurement years	none scheduled
Scheduled treatment years	none scheduled

Study sites	Property	Value
Wicklow township, Conc. 11-12, Lots 6-7	Latitude	45 / 26
	Longitude	77 / 47
	Radius	250 m
	Site class	2
	Species	northern red oak
	Type	plot

Data location	Property	Value
SSI (North Bay)-MNR	Analog formats	paper map(s)
	Analog formats	photocopied sheets
	Analog formats	photographs
	Digital formats	hardwood archive

Publications

Fleck, B. 2000. Case study: Bancroft District oak management. *In* The Ecology, Silviculture and Management of Great Lakes-St. Lawrence Oak: Proceedings of the Your Forest–Your Choice Conference Series, Part 7, Nov. 1-3, 2000, Bracebridge, ON. Westwind For. Steward., Inc. 95 pp.

Kourtz, P. 2002. Red oak prescribed burn expert system. Ont. Min. Nat. Resour., Southcent. Sci. Inf. Sect., North Bay, ON. CD-ROM.

Westwind Forest Stewardship, Inc. 2000. The Ecology, Silviculture and Management of Great Lakes-St. Lawrence Oak: Proceedings of the Your Forest–Your Choice Conference Series, Part 7, Nov. 1-3, 2000, Bracebridge, ON. Westwind For. Steward., Inc. 95 pp.

3.09.1 Red oak establishment under closed and shelterwood canopy

Study pseudonyms	Gostling Lake north	
Study instigator	Dan Dey	
Associated staff	Dave Deugo; William Cole	
Current contact	Bill Parker	
Abstract	Red oak 2+0 seedlings were underplanted in an undisturbed mature hardwood stand. The following year, a shelterwood harvest was implemented. Overstory density effects on seedling survival and growth were assessed 2 years after planting. Results suggested that red oak underplanted in an uncut stand 2 or more years before a scheduled shelterwood harvest will be at a competitive disadvantage once they are released. Therefore planted oak should not remain under a closed canopy overstory for more than 1 year.	
Objectives	To measure the effects of 2 overstory densities on survival and growth of underplanted red oak. To evaluate feasibility of planting red oak several years before a harvest through examination of 2-year growth trends in underplanted oaks in response to overstory density.	
Layout/design	The stands ranged from 0.5 - 1.0 ha. 54 plots were established and underplanted with seedlings. Shelterwood harvest to 50% level occurred in 18 plots and to the 70% level in a further 18 plots. An additional 18 plots were left uncut.	
Comments		
Activity	2 Active Irregular–data set irregularly updated and maintained	
Quality	1 Excellent	
Stability	1 Very Stable–current format/hard copy/backed up/annotated	
Silvicultural treatments	none; planting; shelterwood	
Measurements	crown closure (%); basal area; DBH; height; regeneration tally	
Map types	district map; sketch	
Establishment year	1992	
Measurement years	1993; 1994; 1995	
Treatment years	1992; 1993; 1994; 1995	
Future measurement years	none scheduled	
Scheduled treatment years	none scheduled	
Study sites	Property	Value
McClintock township, Conc A, Lot 11	Latitude	45 / 17
	Longitude	78 / 55
	Radius	450 m
	Site class	1
	Site class	2
	Species	northern red oak
	Type	plot
Data location	Property	Value
OFRI–MNR	Analog formats	photocopied sheets
	Digital formats	hardwood archive
SSI (North Bay)-MNR	Digital formats	hardwood archive

Publications

Dey, D.C., Parker, W.C. 1996. Regeneration of red oak (*Quercus rubra* L.) using shelterwood systems: Ecophysiology, silviculture and management recommendations. Ont. Min. Nat. Resour., Ont. For. Res. Inst., Sault Ste. Marie, ON. For. Res. Inf. Pap. No. 126. 59 pp.

Dey, D.C., Parker, W.C. 1997. Morphological indicators of stock quality and field performance of red oak (*Quercus rubra* L.) seedlings underplanted in a central Ontario shelterwood. New For. 14: 145-156.

Dey, D.C., Parker, W.C. 1997. Overstorey density affects field performance of underplanted red oak (*Quercus rubra* L.) in Ontario. North. J. Appl. For. 14(3): 120-125.

Parker, W.C., Dey, D.C. 1998. Ecophysiological response of northern red oak (*Quercus rubra* L.) and sugar maple (*Acer saccharum* Marsh.) seedlings to overstory density. *In* Mitchell, A., Puttonen, P. (eds.) Frontiers of Forest Biology: Proc. joint meeting of XVth North American Forest Biology Workshop and Western Forest Genetics Association, June 21-26, 1998, Univ. Victoria, Victoria, B.C.

3.10.1 Shelterwood harvest followed by planting and repeated prescribed burns to increase the red oak component

Study pseudonyms	Bracebridge red oak trial; Red oak restoration project
Study instigator	Dave Deugo
Associated staff	Andrée Morneault; Dianne Othmer
Current contact	Dave Deugo
Abstract	This 10 ha stand received a shelterwood seeding cut, planting of red oak, then two prescribed burns and finally a shelterwood removal cut. This treatment increased the amount of red oak on the site, however only a small proportion was free to grow in 2000. Tending is recommended to increase the oak component.
Objectives	To test silvicultural practices designed to increase the red oak component on sites dominated by poor quality sugar maple and other tolerant hardwoods.
Layout/design	In 1993, 11 plots were established 7years after a shelterwood seeding cut. Nine of the plots were 20 x 20 m and 2 were 10 x 10 m. In 2000, 10 semi-permanent clusters were added. Each cluster had 8 subplots (2 x 2 m)
Comments	
Activity	1 Active Regular–data set regularly updated and maintained
Quality	1 Excellent
Stability	1 Very Stable–current format/hard copy/backed up/annotated
Silvicultural treatments	clipping; planting; prescribed burn; shelterwood
Measurements	browse damage; DBH; height; insect and disease conditions; regeneration tally
Map types	custom site map; sketch
Establishment year	1986
Measurement years	1993; 2000
Treatment years	1986; 1988; 1989; 1995; 1996
Future measurement years	none scheduled
Scheduled treatment years	none scheduled

Study sites	Property	Value
Oakley township, Conc 5-6, Lots 5-6	Latitude	45 / 10
	Longitude	78 / 50
	Radius	150 m
	Site class	1
	Site class	2
	Species	northern red oak
	Type	plot

Data location	Property	Value
SSI (North Bay)-MNR	Analog formats	paper map(s)

Publications

None

3.11.1 Red oak underplanting and tending following shelterwood harvest

Study pseudonyms	Ridout township oak trial
Study instigator	Andy Gordon
Associated staff	Murray Woods; Dave Deugo; Andrée Morneault
Current contact	Andy Gordon
Abstract	A 2-cut shelterwood harvest was followed by red oak underplanting and competition control using prescribed burning and herbicide on a typical red oak site.
Objectives	To determine optimal planting stock and cultural practices to artificially renew red oak.
Layout/design	Three blocks, each containing 3 20 x 60 m main plots, with all combinations of: red oak nursery stock (1 +0, 1 + 1); competition control: prescribed burning, herbicide, control (assigned to main plots in a randomized block design); stock type treatments randomly assigned to 20 x 20 m sub-plots.
Comments	Split-plot design used since burning doesn't lend itself to non-restricted randomization.
Activity	2 Active Irregular–data set irregularly updated and maintained
Quality	1 Excellent
Stability	1 Very Stable–current format/hard copy/backed up/annotated
Silvicultural treatments	clipping; herbicide; planting; prescribed burn; shelterwood
Measurements	height; regeneration tally
Map types	custom site map; district map
Establishment year	1985
Measurement years	1991; 2000
Treatment years	1985; 1986; 1987; 1988; 1989; 1990
Future measurement years	none scheduled
Scheduled treatment years	none scheduled

Study Sites	Property	Value
Ridout township, Conc 2 & 3, Lots 23 & 24	Latitude	45 / 05
	Longitude	79 / 05
	Radius	100 m
	Site class	2
	Site class	3
	Species	northern red oak
	Type	plot

Data location	Property	Value
OFRI–MNR	Digital formats	Hardwood archive
SSI (North Bay)-MNR	Analog formats	paper map(s)
	Digital formats	Hardwood archive
University of Guelph	Analog formats	original tally sheets

Publications

Gordon, A.M. 1985. Maintaining a red oak component in the hardwood forests of southern Ontario. Proposal to the Ontario Renewable Resource Research Fund Grant Program, Univ. Guelph., Dept. Environ. Biol., Guelph, ON. 26 pp.

Gordon, A.M. 1987. Post-harvesting silvicultural techniques to enhance the red oak component of shallow-site forests in central Ontario. Presented at USDA, Northeastern and North Central Forest Experiment Station, Broomall, PA. 1 p.

Gordon, A.M. 2000. Ridout Township oak trial. *In* The Ecology, Silviculture and Management of Great Lakes-St. Lawrence Oak: Proceedings of the Your Forest–Your Choice Conference Series, Part 7, Nov. 1-3, 2000, Bracebridge, ON. Westwind For. Steward., Inc. 95 pp.

3.12.1 Shelterwood harvest with partial chemical site preparation and red oak underplanting

Study pseudonyms	Forest Management Trail Stop 3; Frost Centre	
Study instigator	George Stroempl	
Associated staff	N/A	
Current contact	Mike Turner	
Abstract	The area received a shelterwood harvest during the winter of 1986-87, resulting in residual crown closure of approximately 50%. As no natural red oak regeneration existed, half the area was treated with herbicide to reduce competition from maple and half the area remained untreated. The entire area was planted with either sprouted acorns in cardboard tubes or 1 + 0 nursery stock. No other follow-up treatments were performed. In 2000, sprayed area had 40% survival of planted red oak, approximately 1 to 2 m in height while unsprayed area is well stocked with maple saplings and only 4% of planted red oak survived.	
Objectives	To compare survival and growth of red oak artificial regeneration from sprouted acorns in tubes with 1+0 bareroot stock. To monitor the effect of competition of red oak regeneration.	
Layout/design	Eight rows of 25 sprouted acorns in tubes with rows of 1+0 bareroot stock planted in between. The area was divided into 4 compartments. Three compartments were sprayed with glyphosate prior to planting and 1 compartment (control) was not sprayed.	
Comments	A similar study comparing sprouted acorns to bareroot stock was conducted nearby on the west side of the Dan Lake Road but without herbicide treatment.	
Activity	3 Inactive Available–data set static/available	
Quality	2 Good	
Stability	3 Moderately Unstable–obsolete format/poor hard copy	
Silvicultural treatments	planting; shelterwood; site preparation-chemical	
Measurements	crown closure (%); height; regeneration tally	
Map types	district map; sketch	
Establishment year	1986	
Measurement years	1989; 1990	
Treatment years	1986; 1988; 1989	
Future measurement years	none scheduled	
Scheduled treatment years	none scheduled	
Study sites	**Property**	**Value**
Ridout township, Conc 3, Lot 3	Latitude	45 / 10
	Longitude	78 / 50
	Radius	30 m
	Site class	1
	Site class	2
	Species	northern red oak
	Type	plot
Data location	**Property**	**Value**
Bancroft District–MNR	Analog formats	paper map(s)
OFRI–MNR	Analog formats	paper map(s)

Publications

Turner, M. 2000. Case study: Leslie Frost Centre oak management. *In* The Ecology, Silviculture and Management of Great Lakes-St. Lawrence Oak: Proceedings of the Your Forest–Your Choice Conference Series, Part 7, Nov. 1-3, 2000, Bracebridge, ON. Westwind For. Steward., Inc. 95 pp.

3.13.1 Comparison of direct seeding techniques for red oak regeneration

Study pseudonyms	Bruin Lake MS Access Trail; Fagan Ponds; Frost Centre; Sherborne Lake Road	
Study instigator	George Stroempl	
Associated staff	N/A	
Current contact	Mike Turner	
Abstract	This trial explored the relationship between acorn size and protective tubing on regeneration success.	
Objectives	To compare survival and growth of different sized red oak acorns planted with and without protective tubes.	
Layout/design	Sherborne area: plots 0.20 ha, containing 4 repetitions of 6 rows of 25 acorns of 3 sizes (small, medium, large); Stanhope area: plots 0.20 ha in, containing 2 repetitions of 6 rows of 25 acorns of 3 sizes.	
Comments	Trees in Sherborne subplots 1 and 2 did not survive due to severe competition.	
Activity	4 Inactive Unavailable–data wholly or partially lost	
Quality	2 Good	
Stability	2 Moderately Stable–current format/hard copy	
Silvicultural treatments	protective tubes; seeded manually	
Measurements	crown closure (%); height; regeneration tally	
Map types	district map	
Establishment year	1988; 1989	
Measurement years	1989; 1990; 1991	
Treatment years	1988	
Future measurement years	none scheduled	
Scheduled treatment years	none scheduled	
Study sites	**Property**	**Value**
Sherborne Twp, Conc 4, Lot 7	Latitude	45 / 11
	Longitude	78 / 47
	Radius	30 m
	Site class	2
	Species	northern red oak
	Type	plot
Stanhope Twp, Conc 12, Lot 2	Latitude	45 / 09
	Longitude	78 / 47
	Radius	30 m
	Site class	2
	Species	northern red oak
	Type	plot
Data location	**Property**	**Value**
OFRI–MNR	Analog formats	computer printouts
SSI (North Bay)-MNR	Analog formats	computer printouts
	Analog formats	paper map(s)

Publications

Stroempl, G. 1986. Conditions of red oak nursery stock as related to outplanting. Pp. 90-92 *in* Proc. Nurserymen's Meeting, June 24-27, 1985, Orono Forest Station. Ont. Min. Nat. Resour. Orono, ON. 110 pp.

3.14.1 Underplanting red oak stock in a Scots pine plantation

Study pseudonyms	Frost Centre; Pine Springs	
Study instigator	George Stroempl	
Associated staff	N/A	
Current contact	Mike Turner	
Abstract	A Scots pine stand was thinned to 70% crown closure, underplanted with red oak nursery stock and then further thinned to 50% crown closure.	
Objectives	To check survival and growth of red oak bareroot stock underplanted in a Scots pine plantation.	
Layout/design	Two plots of 0.10 ha.	
Comments		
Activity	5 Unknown	
Quality	2 Good	
Stability	4 Very Unstable–obsolete format/missing or damaged hard copy	
Silvicultural treatments	planting; thinning-rows	
Measurements	crown closure (%); regeneration tally	
Map types	district map	
Establishment year	1988	
Measurement years	unknown	
Treatment years	1985; 1991	
Future measurement years	none scheduled	
Scheduled treatment years	none scheduled	
Study sites	**Property**	**Value**
Hindon Twp, Conc. 3, Lot 32	Latitude	45 / 07
	Longitude	78 / 50
	Radius	30 m
	Site class	2
	Species	northern red oak
	Species	Scots pine
	Type	plot
Data location	**Property**	**Value**
SSI (North Bay)-MNR	Analog formats	paper map(s)

Publications

Ontario Ministry of Natural Resources. Undated. George Stroempl's Red Oak Field Work. Ont. Min. Nat. Resour., Maple, ON. 6 pp.

3.15.1 Preharvest red oak establishment using herbicides, underplanting, and tending

Study pseudonyms	Bancroft District; Watt Lake	
Study instigator	Bruce Fleck	
Associated staff	Andrée Morneault	
Current contact	Bruce Fleck	
Abstract	This investigation explored techniques to regenerate red oak prior to overstory removal. Based on the study's findings the following recommendations were made: increase the light level first by a light thinning from below, apply herbicide to control competition, plant healthy seedlings or sow acorns, reduce the canopy to 8 m^2/ha or less as soon as seedlings are established (2 to 3 years for seedlings and slightly longer for acorns).	
Objectives	To establish oak within the Watt Lake deer yard while preserving the aesthetics of the lakeside location.	
Layout/design	Ten semi-permanent clusters were established approximately 25 m between clusters. Each cluster consists of 8 (2 x 2 m) plots.	
Comments	Oak has been heavily browsed. Only 10% of red oak is free-to-grow. Additional tending required.	
Activity	2 Active Irregular–data set irregularly updated and maintained	
Quality	2 Good	
Stability	2 Moderately Stable–current format/hard copy	
Silvicultural treatments	herbicide; planting; shelterwood; tending	
Measurements	basal area; height; regeneration tally; stocking	
Map types	custom site map; district map	
Establishment year	1989	
Measurement years	1990	
Treatment years	1990; 1991; 1992; 1993; 1996	
Future measurement years	none scheduled	
Scheduled treatment years	none scheduled	
Study sites	**Property**	**Value**
Herschel Twp, (just east of Watt Lake)	Latitude	45 / 10
	Longitude	77 / 58
	Radius	250 m
	Site class	2
	Species	northern red oak
	Type	plot
Data location	**Property**	**Value**
Bancroft District–MNR	Analog formats	paper map(s)
	Analog formats	photographs
SSI (North Bay)-MNR	Analog formats	computer printouts
	Analog formats	paper map(s)
	Digital formats	CD-ROM

Publications

Fleck, B. 2000. Case study: Bancroft District oak management. *In* The Ecology, Silviculture and Management of Great Lakes-St. Lawrence Oak: Proceedings of the Your Forest–Your Choice Conference Series, Part 7, Nov. 1-3, 2000, Bracebridge, ON. Westwind For. Steward., Inc. 95 pp.

3.16.1 Comparison of red oak restoration techniques

Study pseudonyms	Bancroft District; Papineau Lake oak restoration project
Study instigator	Bruce Fleck
Associated staff	Andrée Morneault
Current contact	Bruce Fleck
Abstract	This study compared a variety of overstory light levels, and sowing, planting, and site preparation techniques for regenerating oak. Recommendations from the study include (1) maintain a shelterwood canopy, (2) apply light to moderate fire, (3) plant quality seedlings, (4) remove most of the overstory when planted stock is established, (5) control poplar competition prior to burning, or avoid planting such areas, or risk using large stock, and (6) manual tending may be required to maintain adequate oak stocking.
Objectives	To test alternative methods of artificially regenerating red oak by comparing: (1) seeding methods: shallow/deep, protected/unprotected, spring/fall; (2) planting methods: decapitated/not decapitated, protected/unprotected; (3) canopy closure: open/closed; (4) site preparation: burned/not burned. To regenerate red oak in a stand dominated by white birch and sugar maple.
Layout/design	Total area is 45 ha. Block A is located in the north half and Block B is in the south. Thirteen semi-permanent clusters (7 in Block A/6 in Block B) established. Each cluster consists of 8 plots (2 x 2 m).
Comments	Only 20% of the red oak > 1 m in height classified as "free-to-grow".
Activity	2 Active Irregular–data set irregularly updated and maintained
Quality	1 Excellent
Stability	1 Very Stable–current format/hard copy/backed up/annotated
Silvicultural treatments	clearcut; harvest cut; planting; prescribed burn
Measurements	basal area; height; regeneration tally; soil textures; stocking
Map types	custom site map; district map
Establishment year	1986
Measurement years	2000
Treatment years	1986; 1988; 1995
Future measurement years	none scheduled
Scheduled treatment years	none scheduled

Study sites	Property	Value
Wicklow Twp, Conc IX lots 4-6 & Conc X lots 4-5	Latitude	45 / 25
	Longitude	77 / 50
	Radius	400 m
	Site class	1
	Species	northern red oak
	Type	plot

Data location	Property	Value
SSI (North Bay)-MNR	Analog formats	original tally sheets
	Analog formats	paper map(s)
	Analog formats	photographs
	Digital formats	CD-ROM

Publications

Fleck, B. 2000. Case study: Bancroft District oak management. In The Ecology, Silviculture and Management of Great Lakes-St. Lawrence Oak: Proceedings of the Your Forest–Your Choice Conference Series, Part 7, Nov. 1-3, 2000, Bracebridge, ON. Westwind For. Steward., Inc. 95 pp.

Ontario Ministry of Natural Resources. 1988. Proc. Red oak regeneration meeting, Bracebridge District. Nov. 29, 1988. Ont. Min. Nat. Resour., Bracebridge, ON. Unpubl. rep.

Stroempl, G. 1986. Conditions of red oak nursery stock as related to outplanting. Pp. 90-92 in Proc. Nurserymen's Meeting, June 24-27, 1985, Orono Forest Station. Ont. Min. Nat. Resour. Orono, ON. 110 pp.

3.17.1 Group selection to promote mid-tolerant hardwoods

Study pseudonyms	Bracebridge area; Bracebridge Resource Management Centre	
Study instigator	Dave Deugo	
Associated staff	Barry Davidson	
Current contact	Dave Deugo	
Abstract	This study was designed based on recommendations contained in a 1995 U.S. Forest Service publication "Method for Applying Group Selection in Central Appalachian Hardwoods" by Gary Miller. Both artificial and natural regeneration methods were tested. There is recognition that planned prescribed fire and herbicide treatments (basal bark application) would be beneficial, if not critical, to the establishing oak.	
Objectives	To facilitate reproduction in the management of moderately tolerant hardwood trees (i.e., red oak, white ash and black cherry) using a silvicultural system that has less visual impact than traditional clearcuts.	
Layout/design	Circular openings of various sizes.	
Comments		
Activity	3 Inactive Available–data set static/available	
Quality	2 Good	
Stability	2 Moderately Stable–current format/hard copy	
Silvicultural treatments	group selection; planting	
Measurements	basal area; DBH; regeneration tally	
Map types	custom site map; district map	
Establishment year	1998	
Measurement years	1998	
Treatment years	1998	
Future measurement years	none scheduled	
Scheduled treatment years	none scheduled	
Study sites	**Property**	**Value**
Macaulay township, Conc 8 Lot 8	Latitude	45 / 05
	Longitude	79 / 20
	Radius	200 m
	Site class	1
	Site class	2
	Species	black cherry
	Species	northern red oak
	Species	white ash
	Type	plot
Data location	**Property**	**Value**
Bracebridge Area Office–MNR	Analog formats	paper map(s)

Publications

None

3.18.1 Strip cutting and artificial regeneration to establish red oak

Study pseudonyms	Bracebridge area; Bracebridge Resource Management Centre
Study instigator	George Stroempl
Associated staff	Dave Deugo; Mike Walsh
Current contact	Andrée Morneault
Abstract	Following a strip cut, 3 artificial renewal treatments for red oak were assessed. Root pruned and top clipped red oak did not grow or survive any better than untreated stock. Both forms of nursery stock had multiple stems and were heavily browsed. The red oak established by sowing acorns had higher mortality than the bareroot stock and mortality was highest in the centre of the strip away from shade.
Objectives	To assess artificial regeneration techniques that could be used to establish red oak.
Layout/design	Three treatments applied: Site A: planted nursery stock with root pruning and top clipping, 8 plots over 0.40 ha; Site B: planted nursery stock normal, 4 plots over 0.20 ha; Site C: sowed acorns, 2 plots over 0.10 ha.
Comments	
Activity	5 Unknown
Quality	5 Unknown
Stability	5 Unknown
Silvicultural treatments	planting; protective netting; seeded manually; site preparation; strip cut
Measurements	browse damage; height; regeneration tally
Map types	custom site map; district map
Establishment year	1987; 1988
Measurement years	1988; 1989
Treatment years	1987; 1988
Future measurement years	none scheduled
Scheduled treatment years	none scheduled

Study sites	Property	Value
Macaulay Twp, Conc 10, Lot 9	Latitude	45 / 05
	Longitude	79 / 20
	Radius	300 m
	Site class	1
	Species	northern red oak
	Type	plot

Data location	Property	Value
Bracebridge Area	Analog formats	paper map(s)
Office–MNR	Analog formats	photocopied sheets
SSI (North Bay)-MNR	Analog formats	paper map(s)
	Analog formats	photocopied sheets

Publications

Ontario Ministry of Natural Resources. 1988. Proc. Red oak regeneration meeting, Bracebridge District. Nov. 29, 1988. Ont. Min. Nat. Resour., Bracebridge, ON. Unpubl. rep.

Stroempl, G., Deugo, D.T., Wright, K., Secker, P.W., Metcalf, H., Schenk, M., Fleck, B. 1989. Red oak regeneration program in Ontario. *In* Forestry Research Marketplace: Results in Action: Proc. Ont. For. Res. Com. Symp., Nov. 21-23, 1989, Toronto, ON. OFRC Symp. Proc. O-P-18. 151 pp.

3.19.1 Evaluation of bareroot and container red oak stock types

Study pseudonyms	Nipissing Forest; North Bay District
Study instigator	Ted Wilson
Associated staff	N/A
Current contact	Norm Cottam
Abstract	This study was initiated to compare the performance of bareroot and container stock types of red oak on a clear cut site in central Ontario. The study concluded that due to differences in root architecture, the container stock has a higher capacity to survive and grow than the bareroot stock during the early stages of establishment.
Objectives	To compare the morphological and physiological quality of container and bareroot seedlings at the time of planting. To assess performance in container and bareroot stock types after 1 growing season in the field. To measure root performance and root growth parameters.
Layout/design	Eighty-four seedlings of each stock type were evaluated (168 total). For each stock type, 60 were planted in the field and 24 were analyzed in the laboratory. Seedlings were planted in alternating rows of 10 seedlings per stock type.
Comments	
Activity	2 Active Irregular–data set irregularly updated and maintained
Quality	2 Good
Stability	5 Unknown
Silvicultural treatments	clearcut; planting
Measurements	DBH; height; regeneration tally
Map types	district map
Establishment year	1996
Measurement years	1997; 1998
Treatment years	1996; 1997
Future measurement years	none scheduled
Scheduled treatment years	none scheduled

Study sites	Property	Value
Nipissing Forest	Site class	1
	Site class	3
	Species	northern red oak
	Type	plot

Data location	Property	Value
Nipissing Forest Resource Management Inc.	Analog formats	paper map(s)

Publications

None

3.20.1 Comparison of site preparation and artificial regeneration techniques for red oak

Study pseudonyms	Bancroft District; Papineau Lake
Study instigator	George Stroempl
Associated staff	N/A
Current contact	Bruce Fleck
Abstract	Following a harvest and a partial prescribed burn, the study was established to investigate the effect of various planting depths of acorns, acorn protection methods, decapitation of nursery stock, planting season, prescribed fire, various light levels/crown closures, and the benefits of seedling protection on the survival and growth of the red oak regeneration.
Objectives	To compare the survival and growth of underplanted red oak regeneration resulting from the following treatments: (i) bareroot stock; (ii) bareroot stock decapitated at 15 cm; (iii) acorn tubes open; and (iv) acorn tubes closed for both a burned and unburned shelterwood cut. To compare the growth and survival of protected (planting tubes) vs. unprotected red oak stock.
Layout/design	Eighteen plots (12 plots in burned area, 6 plots in non-burned area), each plot consist of 4 rows of 15 trees each, and each row consists of a different treatment method. Treatments are: (1) bareroot ; (2) bareroot decapitated; (3) acorn container open; (4) acorn container closed. Tubex protectors were established randomly throughout the burned and non-burn areas; each protected tree was planted.
Comments	Overlaps study titled Comparison of red oak restoration techniques (3.16.1). Internal file report prepared.
Activity	4 Inactive Unavailable–data wholly or partially lost
Quality	5 Unknown
Stability	3 Moderately Unstable–obsolete format/poor hard copy
Silvicultural treatments	harvest cut; planting; prescribed burn; protective tubes; seeded manually
Measurements	basal area; browse damage; height; quality class; regeneration tally
Map types	custom site map; district map
Establishment year	1988
Measurement years	1989; 1991
Treatment years	1987; 1988
Future measurement years	none scheduled
Scheduled treatment years	none scheduled

Study Sites	Property	Value
Wicklow Twp, Conc 9, Lots 7 & 8	Latitude	45 / 25
	Longitude	77 / 50
	Radius	200 m
	Site class	1
	Species	northern red oak
	Type	plot

Data location	Property	Value
Bancroft District–MNR	Analog formats	paper map(s)
OFRI–MNR	Analog formats	original tally sheets
	Analog formats	paper map(s)

Publications

Stroempl, G. 1986. Conditions of red oak nursery stock as related to outplanting. Pp. 90-92 *in* Proc. Nurserymen's Meeting, June 24-27, 1985, Orono Forest Station. Ont. Min. Nat. Resour. Orono, ON. 110 pp.

Stroempl, G. 1989. Red oak regeneration program in Ontario: An overview of management and research (oral presentation). Presented at 4th Workshop on Seedling Physiology and Growth Problems in Oak Plantings, Mar. 1-2, 1989, Columbus, OH. 4 pp.

Stroempl, G. 1990. Some areas of concern in red oak management and research. Pp. 1-4 *in* Proc. Red Oak Management Seminar, Dec. 18, 1990, Bracebridge, ON.

Stroempl, G. Undated. Regenerating red oak under deer competition. Ont. Min. Nat. Resour., Maple, ON. Unpubl. Rep. 2 pp.

3.21.1 Fertilization to promote underplanted red oak

Study pseudonyms	Gromax fertilizer	
Study instigator	Silvia Strobl	
Associated staff	Rob Spence	
Current contact	Silvia Strobl	
Abstract	A controlled release fertilizer (GromaxR) containing nitrogen, phosphorous, and potassium, plus moisture-absorbing gel is designed to help seedlings overcome nutrient and moisture deficiencies. This trial was established to evaluate whether the growth response is adequate to warrant operational fertilizer use.	
Objectives	To test several formulations of a slow-release fertilizer to compare growth responses. To determine if growth response is sufficient to eliminate one early tending operation in red oak underplanting. To evaluate cost-effectiveness of treatment.	
Layout/design	Randomized complete block design with no replication and a one-way treatment structure. Treatments were: 1) Gro-pak transplant-2 2) Gro-pak transplant-4 3) Gro-pak plus 4) Boise paper mulch 5) Control (no fertilizer or herbicide) Blocks: areas within the 30 ha hardwood stand where there was a sufficient homogeneous area (i.e., similar canopy/opening, soil depth, slope) in which to plant 15 seedlings at roughly 1.8 m square spacing were chosen as blocks. Experimental units: 3 seedlings randomly located within a block (3-tree non-contiguous plot).	
Comments	Similar trial was also conducted on white pine container stock.	
Activity	5 Unknown	
Quality	5 Unknown	
Stability	5 Unknown	
Silvicultural treatments	fertilization; harvest cut; planting	
Measurements	DBH; height; regeneration tally	
Map types	district map	
Establishment year	1992	
Measurement years	1993	
Treatment years	1992	
Future measurement years	none scheduled	
Scheduled treatment years	none scheduled	
Study sites	**Property**	**Value**
Tweed	Radius	300 m
	Species	northern red oak
	Type	plot
Data location	**Property**	**Value**
Tweed Workcentre–MNR	Analog formats	paper map(s)

Publications

Ontario Ministry of Natural Resources. 1994. Vegetation Management Alternatives Program. Pp. 10-14 *in* Central Region Science and Technology, North Bay: annual report 1993-1994. Ont. Min. Nat. Resour., Cent. Reg. Sci. Technol. Devel. Unit, North Bay, ON. 25 pp.

3.22.1 Red oak fall lifting and planting/spring lifting and planting

Study pseudonyms	Bracebridge area
Study instigator	Dan Dey
Associated staff	Dave Deugo; Mike Walsh; Peter Menes
Current contact	Dave Deugo
Abstract	This trial was established to evaluate whether alternative regeneration practices such as fall lifting followed by planting improves red oak survival on sites with competing vegetation. Red oak nursery stock were lifted at 3 times: early fall, late fall, and spring, and planted at 3 times: early fall, late fall, and spring.
Objectives	To determine if red oak can be successfully lifted from the nursery and planted in the fall. To evaluate alternatives to the traditional nursery practice of fall lifting and overwintering stock in nursery heel-in beds.
Layout/design	Thirty plots, 6 treatments with 5 replications. Red oak stock lifted in early fall lift were planted at 3 different times, those lifted in late fall lift were planted at 2 different times and those lifted in spring were planted once for a total of 6 treatments.
Comments	A description of this study is on the hardwood archive CD-ROM, identified as "falift".
Activity	2 Active Irregular–data set irregularly updated and maintained
Quality	1 Excellent
Stability	1 Very Stable–current format/hard copy/backed up/annotated
Silvicultural treatments	planting; shelterwood
Measurements	DBH; height; leaf indices; regeneration tally
Map types	district map; plot map; sketch
Establishment year	1993
Measurement years	1994; 1995
Treatment years	1993; 1994
Future measurement years	none scheduled
Scheduled treatment years	none scheduled

Study sites	Property	Value
Ridout township, Conc.4, Lots 20 - 21	Latitude	45 / 05
	Longitude	79 / 05
	Radius	50 m
	Site class	2
	Species	northern red oak
	Type	plot

Data location	Property	Value
OFRI–MNR	Analog formats	computer printouts
	Analog formats	paper map(s)
	Digital formats	Hardwood archive

Publications

Westwind Forest Stewardship, Inc. 2000. The Ecology, Silviculture and Management of Great Lakes-St. Lawrence Oak: Proceedings of the Your Forest–Your Choice Conference Series, Part 7, Nov. 1-3, 2000, Bracebridge, ON. Westwind For. Steward., Inc. 95 pp.

3.23.1 Biennial repeated burns for red oak regeneration

Study pseudonyms	Biennial repeated burn trial; Kemptville District; Lanark County; Park Lake
Study instigator	Martin Streit
Associated staff	Linda Forsyth
Current contact	Andrée Morneault
Abstract	This trial was not completed as planned due to funding cutbacks. However, management treatments continued and results were documented. Following a shelterwood harvest, improvement cut, and insecticide application, 2 prescribed burns were conducted. The goal was to release a well-stocked crop of red oak 1- to 3-year-old seedlings and seedling-sprouts from a suppressing layer of maple shrubs. The 1994 burn (13 ha) did not adequately control sapling-sized competition requiring a subsequent burn (29 ha) in 1998.
Objectives	To examine the effect of biennial understory leaf burns on the sprouting capacity, survival, and growth of red oak regeneration. To examine the effect of biennial understory leaf burns on the abundance and size of woody understory vegetation. To examine the effect of biennial understory leaf burns on the overstory trees retained in the burned area. To examine the influence of overstory trees on understory regeneration.
Layout/design	Original design: area 1.5 ha, randomized complete block design with 3 replications of 4 treatments: (1) single burn 1993, (2) burns 1993 and 1995, (3) burns 1993, 1995, and 1997, and (4) control. Treatment plots measure 25 x 25 m. Sampling occurred within 5 randomly located 10 m^2 assessment plots within each treatment plot.
Comments	No post-burn reports were produced.
Activity	2 Active Irregular–data set irregularly updated and maintained
Quality	2 Good
Stability	1 Very Stable–current format/hard copy/backed up/annotated
Silvicultural treatments	improvement cut; insecticide; prescribed burn; shelterwood
Measurements	crown closure (%); crown quality; DBH; height; regeneration tally; stocking
Map types	digital
Establishment year	1992
Measurement years	1992; 1993; 1994; 1996; 1998; 2000
Treatment years	1984; 1985; 1986; 1994; 1998
Future measurement years	none scheduled
Scheduled treatment years	none scheduled

Study Sites	Property	Value
Dalhousie township, Conc. 9, Lot 25	Radius	70 m
	Site class	2
	Species	northern red oak
	Type	operational assessment
	Type	plot

Data location	Property	Value
SSI (North Bay)-MNR	Analog formats	photocopied sheets
	Analog formats	photographs
	Digital formats	CD-ROM
	Digital formats	GIS

Publications

Kourtz, P. 2002. Red oak prescribed burn expert system. Ont. Min. Nat. Resour., Southcent. Sci. Inf. Sect., North Bay, ON. CD-ROM.

Ontario Ministry of Natural Resources. 1993. Hardwood program. *In* Central Region Science and Technology Development Unit: Annual report 1992-1993. Ont. Min. Nat. Resour., Cent. Ont. Sci. Technol. Devel. Unit, North Bay, ON. 28 pp.

Ontario Ministry of Natural Resources. 1993. Vegetation Management Alternatives Program. Pp. 15-20 *in* Central Region Science and Technology Development Unit: Annual report 1992-93. Ont. Min. Nat. Resour., Cent. Ont. Sci. Technol. Devel. Unit, North Bay, ON. 28 pp.

Ontario Ministry of Natural Resources. 1994. Vegetation Management Alternatives Program. Pp. 10-14 *in* Central Region Science and Technology, North Bay: Annual report 1993-1994. Ont. Min. Nat. Resour., Cent. Reg. Sci. Technol. Devel. Unit, North Bay, ON. 25 pp.

Ontario Ministry of Natural Resources. 2001. Using prescribed fire to maintain or restore red oak ecosystems – a literature survey. Southcentral Sci. Inf. Sect., North Bay, ON. CD-ROM.

Streit, M. 2000. Case study: Lanark area oak management. *In* The Ecology, Silviculture and Management of Great Lakes-St. Lawrence Oak: Proceedings of the Your Forest–Your Choice Conference Series, Part 7, Nov. 1-3, 2000, Bracebridge, ON. Westwind For. Steward., Inc. 95 pp.

Wagner, R.G., Buse, L.J., Lautenschlager, R.A., Bell, F.W., Hollstedt, C., Strobl, S., Morneault, A.E., Lewis, W., Ter-Mikaelian, M.T. 1995. Treatment alternatives. Pp. 16-43 *in* Vegetation management alternatives program: 1994-1995 annual report. Ont. Min. Nat. Resour., Ont. For. Res. Inst., Sault Ste. Marie, ON. 99 p.

Westwind Forest Stewardship, Inc. 2000. The Ecology, Silviculture and Management of Great Lakes-St. Lawrence Oak: Proceedings of the Your Forest–Your Choice Conference Series, Part 7, Nov. 1-3, 2000, Bracebridge, ON. Westwind For. Steward., Inc. 95 pp.

3.24.1 Operational prescribed burns to control competition and promote resprouting

Study pseudonyms	Kemptville District; Lanark County; Military Trail
Study instigator	Martin Streit
Associated staff	Linda Forsyth
Current contact	Andrée Morneault
Abstract	Prior to burning the area received a shelterwood harvest, precommercial thinning, partial herbicide application, and planting of 15,400 bareroot red oak stock. The 2 large operational prescribed burns spaced 5 years apart successfully reduced the ironwood and sugar maple competition, encouraged resprouting of red oak seedlings, reduced slash and exposed mineral soil. Burning indices used are recommended as benchmarks.
Objectives	To examine options for ensuring successful regeneration of red oak. To reduce the growth of competing sugar maple and ironwood. To promote re-sprouting of red oak.
Layout/design	Area burned was 70 ha.
Comments	Information about the planned post-burn shelterwood removal cut would be useful.
Activity	2 Active Irregular–data set irregularly updated and maintained
Quality	2 Good
Stability	1 Very Stable–current format/hard copy/backed up/annotated
Silvicultural treatments	herbicide; planting; prescribed burn; shelterwood; precommercial thinning
Measurements	live/dead status; height; regeneration tally; soil moisture; soil textures; stocking
Map types	digital
Establishment year	1995
Measurement years	1995; 1996; 1999; 2000
Treatment years	1988; 1989; 1991; 1992; 1995; 2000
Future measurement years	none scheduled
Scheduled treatment years	none scheduled

Study sites	Property	Value
Lavant township	Latitude	45 / 11
	Longitude	76 / 15
	Radius	470 m
	Site class	2
	Species	northern red oak
	Type	operational assessment

Data location	Property	Value
SSI (North Bay)-MNR	Analog formats	photocopied sheets
	Digital formats	CD-ROM
	Digital formats	GIS

Publications

Kourtz, P. 2002. Red oak prescribed burn expert system. Ont. Min. Nat. Resour., Southcent. Sci. Inf. Sect., North Bay, ON. CD-ROM.

Ontario Ministry of Natural Resources. 2001. Using prescribed fire to maintain or restore red oak ecosystems – a literature survey. Southcentral Sci. Inf. Sect., North Bay, ON. CD-ROM.

Streit, M. 2000. Case study: Lanark area oak management. *In* The Ecology, Silviculture and Management of Great Lakes-St. Lawrence Oak: Proceedings of the Your Forest–Your Choice Conference Series, Part 7, Nov. 1-3, 2000, Bracebridge, ON. Westwind For. Steward., Inc. 95 pp.

Westwind Forest Stewardship, Inc. 2000. The Ecology, Silviculture and Management of Great Lakes-St. Lawrence Oak: Proceedings of the Your Forest–Your Choice Conference Series, Part 7, Nov. 1-3, 2000, Bracebridge, ON. Westwind For. Steward., Inc. 95 pp.

3.25.1 Operational prescribed burns to release red oak regeneration

Study pseudonyms	Indian River; Kemptville District; Lanark County	
Study instigator	Martin Streit	
Associated staff	Linda Forsyth	
Current contact	Andrée Morneault	
Abstract	Shelterwood harvesting and precommercial thinning preceeded 2 operational prescribed burns. Conducted in 1996 and 2000, the burns were viewed as successful in meeting the objective of releasing red oak regeneration from competition. However, fire managers recommend that for future large prescribed burns indices for south-facing slopes be recorded separately as they can be much higher than the site average.	
Objectives	To reduce sugar maple and ironwood competition. To ensure red oak regeneration reaches free-to-grow status.	
Layout/design	Area of prescribed burn was 60 ha.	
Comments	Some scorching and damage to pre-emergent buds occurred in the overstory on south-facing slope, which resulted in no leaf-out during growing season.	
Activity	2 Active Irregular–data set irregularly updated and maintained	
Quality	2 Good	
Stability	2 Moderately Stable–current format/hard copy	
Silvicultural treatments	prescribed burn; shelterwood; precommercial thinning	
Measurements	crown closure (%); live/dead status; regeneration tally; soil moisture; soil textures; stocking	
Map types	district map	
Establishment year	1996	
Measurement years	1996; 1998; 2000	
Treatment years	1988; 1996; 2000	
Future measurement years	none scheduled	
Scheduled treatment years	none scheduled	
Study sites	**Property**	**Value**
Lavant township	Latitude	45 / 15
	Longitude	76 / 20
	Radius	437 m
	Site class	2
	Species	northern red oak
	Type	operational assessment
Data location	**Property**	**Value**
SSI (North Bay)-MNR	Analog formats	paper map(s)

Publications

Forsyth, L. 2000. Case study: Lanark Area oak prescribed burn. *In* The Ecology, Silviculture and Management of Great Lakes-St. Lawrence Oak: Proceedings of the Your Forest–Your Choice Conference Series, Part 7, Nov. 1-3, 2000, Bracebridge, ON. Westwind For. Steward., Inc. 95 pp.

Kourtz, P. 2002. Red oak prescribed burn expert system. Ont. Min. Nat. Resour., Southcent. Sci. Inf. Sect., North Bay, ON. CD-ROM.

Ontario Ministry of Natural Resources. 2001. Using prescribed fire to maintain or restore red oak ecosystems – a literature survey. Southcentral Sci. Inf. Sect., North Bay, ON. CD-ROM.

Streit, M. 2000. Case study: Lanark area oak management. *In* The Ecology, Silviculture and Management of Great Lakes-St. Lawrence Oak: Proceedings of the Your Forest–Your Choice Conference Series, Part 7, Nov. 1-3, 2000, Bracebridge, ON. Westwind For. Steward., Inc. 95 pp.

Westwind Forest Stewardship, Inc. 2000. The Ecology, Silviculture and Management of Great Lakes-St. Lawrence Oak: Proceedings of the Your Forest–Your Choice Conference Series, Part 7, Nov. 1-3, 2000, Bracebridge, ON. Westwind For. Steward., Inc. 95 pp.

3.26.1 Comparison of artificial regeneration techniques for red oak

Study pseudonyms	Gibson Lake west; Parry Sound; Red oak research plots	
Study instigator	George Stroempl	
Associated staff	Paul Secker; Chip Duncan	
Current contact	William Cole	
Abstract	A variety of artificial regeneration methods were used for red oak in a post-shelterwood harvest and clearcut condition. Site preparation consisted of prescribed burning, herbicides, and mechanical. Regeneration was by acorns and 1- and 2-year-old nursery stock using a variety of planting tools and protective coverings. Similar studies were conducted on private land in the area through Woodlands Improvement Act Agreements.	
Objectives	To compare the survival and growth of underplanted and open-grown red oak regeneration on a variety of site prepared conditions resulting from the following treatments: (i) tubeling planted using 3 different tools; (ii) bareroot stock with and without protective tubes; (iii) tubeling vs. acorns; (iv) single vs. double sown acorns; and (v) open tube vs. closed tube and shallow vs. deep sowing of acorns.	
Layout/design	Six rows with 25 individuals per row were assessed for each treatment.	
Comments	Mini-tornado in late 1987 caused considerable damage to study area. Currently forms part of a First Nation land claim.	
Activity	3 Inactive Available–data set static/available	
Quality	3 Fair	
Stability	3 Moderately Unstable–obsolete format/poor hard copy	
Silvicultural treatments	planting; prescribed burn; protective tubes; seeded manually; shelterwood; chemical site preparation; mechanical site preparation	
Measurements	browse damage; height; regeneration tally	
Map types	FRI scale 1:15,840; plot map	
Establishment year	1986	
Measurement years	1988; 1989; 1990	
Treatment years	1986; 1987; 1988	
Future measurement years	none scheduled	
Scheduled treatment years	none scheduled	
Study sites	**Property**	**Value**
Geor Bay Twp-Gibson Ward, Conc 3 & 5, Lots 18	Latitude	44 / 56
	Longitude	79 / 45
	Radius	1 km
	Site class	1
	Species	northern red oak
	Type	plot
Data location	**Property**	**Value**
OFRI–MNR	Analog formats	original tally sheets
	Analog formats	paper map(s)
	Analog formats	photocopied sheets

Publications

Ontario Ministry of Natural Resources. Undated. Comparison of red oak survival and growth. Ont. Min. Nat. Resour., Parry Sound, ON. 7 pp.

Stroempl, G. 1989. Red oak regeneration program in Ontario: An overview of management and research (oral presentation). Presented at 4th Workshop on Seedling Physiology and Growth Problems in Oak Plantings, Mar. 1-2, 1989, Columbus, OH. 4 pp.

Stroempl, G. 1990. Some areas of concern in red oak management and research. Pp. 1-4 *in* Proc. Red Oak Management Seminar, Dec. 18, 1990, Bracebridge, ON.

Stroempl, G., Secker, P.W. 1989. Preliminary guideline for the uniform shelterwood cut. Ont. Min. Nat. Resour., Maple, ON. 9 pp.

Stroempl, G., Secker, P.W. 1995. Guide to the group shelterwood cutting method for regenerating northern red oak. Ont. Min. Nat. Resour., Ont. For. Res. Inst., Sault Ste. Marie, ON. For. Res. Inf. Pap. No. 120. 45 pp.

3.27.1 Herbicide injection to release red oak

Study pseudonyms	EZ-Ject and L'il Beaver to control sugar maple; Tweed District	
Study instigator	Silvia Strobl	
Associated staff	Rob Spence; Scott McPherson	
Current contact	Andrée Morneault	
Abstract	Recognizing the need to control sugar maple competition in areas with young establishing red oak, 2 release treatments were evaluated. Treatments consisted of a herbicide (glyphosate or picloram) administered via the EZJECT lance both with and without girdling (L'il Beaver).	
Objectives	To test efficacy of selected herbicides (glyphosate and picloram) deployed via the EZ-Ject capsule injection system with and without mechanical girdling to release red oak from polewood size sugar maple.	
Layout/design	Trial 1 (no girdling): 4 blocks, with 12 maple in each block, 3 trees per 4 diameter classes (ranging from 0 - 20 cm DBH) treated during 3 different seasons and control. Trial 2 (girdling): 6 blocks, 20 maples in each of 4 diameter classes with control.	
Comments		
Activity	2 Active Irregular–data set irregularly updated and maintained	
Quality	1 Excellent	
Stability	1 Very Stable–current format/hard copy/backed up/annotated	
Silvicultural treatments	girdling; tending	
Measurements	crown quality; dieback level; regeneration tally	
Map types	district map	
Establishment year	1992; 1993	
Measurement years	1994	
Treatment years	1992	
Future measurement years	none scheduled	
Scheduled treatment years	none scheduled	
Study sites	**Property**	**Value**
Anglesea township	Latitude	44 / 44
	Longitude	77 / 20
	Radius	200 m
	Site class	2
	Species	northern red oak
	Type	plot
Data location	**Property**	**Value**
SSI (North Bay)-MNR	Analog formats	paper map(s)
	Analog formats	photocopied sheets
	Digital formats	CD-ROM

Publications

McPherson, S., Strobl, S., Spence, R. 2002. Efficacy of the EZJECT lance for releasing red oak from sugar maple competition. Ont. Min. Nat. Resour., Ont. For. Res. Inst., Sault Ste. Marie, ON. For. Res. Note No. 61. 4 pp.

Ontario Ministry of Natural Resources. 1993. Hardwood program. *In* Central Region Science and Technology Development Unit: Annual report 1992-1993. Ont. Min. Nat. Resour., Cent. Ont. Sci. Technol. Devel. Unit, North Bay, ON. 28 pp.

4.01.1 Black cherry natural regeneration

Study pseudonyms	Chatham; Lambton County; McPhail tract
Study instigator	Dan Dey
Associated staff	Jim Boothby; Andy Koopman
Current contact	Ken Elliott
Abstract	This trial tested prescribed burning and herbicide application as silvicultural tools for assisting in the natural regeneration of black cherry.
Objectives	To investigate different treatments to promote the natural establishment of black cherry.
Layout/design	Eight treatment areas (3 prescribed burns, 3 herbicide, 2 control); within each treatment area, 4 circular 100 m^2 plots were established to measure large understory regeneration (i.e., >2.5 cm DBH) , within each plot regeneration < 2.5 cm DBH was recorded for 2, 4 m^2 subplots.
Comments	
Activity	2 Active Irregular–data set irregularly updated and maintained
Quality	1 Excellent
Stability	1 Very Stable–current format/hard copy/backed up/annotated
Silvicultural treatments	herbicide; prescribed burn
Measurements	basal area; DBH; height; regeneration tally
Map types	custom site map; district map
Establishment year	1993
Measurement years	1994
Treatment years	1994
Future measurement years	none scheduled
Scheduled treatment years	none scheduled

Study sites	Property	Value
Euphemia township, Conc.7, Lot 31	Latitude	42 / 45 / 03
	Longitude	81 / 54 / 00
	Radius	200 m
	Site class	1
	Species	black cherry
	Type	plot

Data location	Property	Value
OFRI–MNR	Analog formats	paper map(s)
	Analog formats	photocopied sheets
	Analog formats	photographs
	Digital formats	Hardwood archive
	Digital formats	SAS
SSI (London)–MNR	Digital formats	Hardwood archive
	Digital formats	SAS

Publications

Wagner, R.G., Buse, L.J., Lautenschlager, R.A., Bell, F.W., Hollstedt, C., Strobl, S., Morneault, A.E., Lewis, W., Ter-Mikaelian, M.T. 1995. Treatment alternatives. Pp. 16-43 in Vegetation management alternatives program: 1994-1995 annual report. Ont. Min. Nat. Resour., Ont. For. Res. Inst., Sault Ste. Marie, ON. 99 p.

4.02.1 Black cherry artificial regeneration

Study pseudonyms	Ausable River; Middlesex County; Parkhill	
Study instigator	Fred von Althen	
Associated staff	N/A	
Current contact	Suzanne Wetzel	
Abstract	Seedlings and transplants of black cherry, black walnut, and white ash were established. The influence planting stock age, stem clipping, and fertilization on tree survival and early height growth were investigated. Findings indicated that age of planting stock had little effect on the survival of all three species or on the height growth of black walnut. height growth of black cherry seedlings was significantly better than transplant growth. height growth of white ash transplants was significantly better than seedling growth. Stem clipping had no effect on the survival of any species but increased height growth sufficiently to compensate, within 3 to 5 years, for the height lost in clipping. Fertilization had no effect on the survival or height growth of the trees.	
Objectives	To determine which cultural practices will promote the artificial establishment of black cherry.	
Layout/design	Factorial design.	
Comments		
Activity	3 Inactive Available–data set static/available	
Quality	5 Unknown	
Stability	3 Moderately Unstable–obsolete format/poor hard copy	
Silvicultural treatments	fertilization; planting; site preparation; tending	
Measurements	DBH; height; soil textures	
Map types	district map	
Establishment year	1968	
Measurement years	1970; 1972; 1974	
Treatment years	1968; 1970	
Future measurement years	none scheduled	
Scheduled treatment years	none scheduled	
Study sites	**Property**	**Value**
Adjacent to Ausable River near Parkhill	Latitude	43 / 08
	Longitude	81 / 47
	Radius	20 m
	Site class	1
	Species	black cherry
	Species	Black walnut
	Species	white ash
	Type	plot
Data location	**Property**	**Value**
Great Lakes Forestry Centre–CFS	Analog formats	computer printouts
	Analog formats	paper map(s)

Publications

von Althen, F.W. 1962. Hardwood planting: a review of the literature. Can. Dept. For., Richmond Hill, ON.

von Althen, F.W. 1964. Hardwood planting problems and possibilities in eastern Canada. Can. Dept. Fish. For., For. Br., For. Res. Lab., Ont. Reg., Ottawa, ON. Dept. For. Publ. No. 1043. 40 pp.

von Althen, F.W. 1971. Effects of weed control on the survival and growth of planted black walnut, white ash and sugar maple. For. Chron. 47(4): 223-226

von Althen, F.W. 1972. Preliminary guide to hardwood planting in southern Ontario. Can. Dept. Env., Can. For. Serv., Grt. Lks. For. Res. Cent., Sault Ste. Marie, ON. Inf. Rep. 0-X-167. 12 pp.

von Althen, F.W. 1974. Methods for the successful establishment of black cherry plantations in southern Ontario. Can. Dept. Env., Can. For. Serv., Grt. Lks. For. Res. Cent., Sault Ste Marie, ON. Inf. Rep. 0-X-205. 13 pp.

von Althen, F.W. 1979. Preliminary guide to site preparation and weed control in hardwood plantations in southern Ontario. Can. Dept. Env., Can. For. Serv., Grt. Lks. For. Res. Cent., Sault Ste. Marie, ON. Inf. Rep. O-X-288. 28 pp.

4.03.2 Basswood and sugar maple thinning

Study pseudonyms	Bancroft District; Herschel township
Study instigator	George Stroempl
Associated staff	Al Beckwith; Bruce Fleck
Current contact	William Cole
Abstract	The growth response of a high quality, 2-tiered 52-year-old stand with a high component of basswood was measured following a commercial thinning operation. Early stand tending is essential if the goal is to retain a significant component of basswood and to maintain its height advantage over sugar maple.
Objectives	To determine how mid-rotation cuts should be implemented (timing, intensity of harvest) to stimulate growth in mid-tolerant species such as basswood.
Layout/design	Experimental details not available. Eight ha area, data were analyzed statistically to determine the significance (1 and 5% levels) of the difference in means, including the corresponding standard errors. All comparisons were made using t-tests with the exception of bole quality data for which a Chi-square test was used.
Comments	Data used in Benchmark Yield Curve Project (1.23.3).
Activity	5 Unknown
Quality	5 Unknown
Stability	5 Unknown
Silvicultural treatments	Thinning
Measurements	crown closure (%); basal area; crown class; crown quality; crown size; DBH; height; quality class; regeneration tally; soil textures; stem analysis; stocking; volume yields
Map types	district map; sketch
Establishment year	1964
Measurement years	1964 post-cut; 1964 pre-cut; 1965; 1976; 1977
Treatment years	1964
Future measurement years	none scheduled
Scheduled treatment years	none scheduled

Study sites	Property	Value
Herschel township	Latitude	45 / 09 / 03
	Longitude	78 / 04 / 59
	Radius	150 m
	Site class	1
	Species	basswood
	Species	sugar maple
	Type	plot

Data location	Property	Value
OFRI-MNR	Analog formats	paper map(s)

Publications

Stroempl, G. 1983. Growth response of basswood and sugar maple to an intermediate cutting. Ont. Min. Nat. Resour., Ont. For. Res. Cent., Maple, ON. Forest Res. Rep. No. 107. 19 pp.

4.04.2 Thinning and growth in a sugar maple, white ash, and basswood stand

Study pseudonyms	Chatsworth thinning plots; Effect of thinning in a hardwood stand; Owen Sound District; Thinning of mixed hardwoods
Study instigator	Peter Jaciw
Associated staff	Al Beckwith; Harvey Anderson; H.C. Larsson
Current contact	William Cole
Abstract	Southern Ontario contains numerous hard maple stands of poor quality and low growth rates. An option to stimulate growth was to thin the younger stems thereby yielding a more merchantable harvest than if the older, larger, and poorer quality stems were removed. Heavy thinning was defined as 50% BA removed, while moderate thinning was defined as 30% BA removed.
Objectives	To investigate the growth response and development of a 45-year-old hardwood stand following 2 different harvests levels.
Layout/design	9 plots in total, 50% BA reduction, 30% BA reduction and control set up in a 3 x 3 latin square design where each compartment was 0.4 ha. Each compartment included an intensively sampled interior plot with a buffer.
Comments	On hardwood archive CD-ROM this study is identified as "Chats".
Activity	2 Active Irregular–data set irregularly updated and maintained
Quality	1 Excellent
Stability	1 Very Stable–current format/hard copy/backed up/annotated
Silvicultural treatments	improvement cut
Measurements	live/dead status; DBH; tree number
Map types	district map
Establishment year	1957
Measurement years	1957; 1958; 1959; 1962; 1967; 1972; 1979; 1982; 1989
Treatment years	1957; 1993
Future measurement years	none scheduled
Scheduled treatment years	none scheduled

Study sites	Property	Value
Sullivan township, Conc 3, Lots 21-23	Latitude	44 / 20
	Longitude	80 / 50
	Radius	100 m
	Site class	1
	Species	basswood
	Species	black cherry
	Species	sugar maple
	Species	white ash
	Type	plot

Data location	Property	Value
OFRI–MNR	Analog formats	computer printouts
	Digital formats	hardwood archive
OFRI–MNR (And.)	Analog formats	computer printouts
	Analog formats	original tally sheets
	Analog formats	paper map(s)
	Digital formats	3.5" floppy disk
	Digital formats	ASCII
	Digital formats	hardwood archive
SSI (North Bay)-MNR	Digital formats	hardwood archive

Publications

Canadian Forest Service. 1973. Management of southwestern Ontario hardwoods: Proc. Can. Ont. Joint For. Res. Comm. Symp., April 1973, Richmond Hill, ON. Dept. Env., Can. For. Serv., Grt. Lks. For. Res. Cent., Sault Ste. Marie, ON. Symp. Proc. O-P-1. 126 pp.

Jaciw, P. 1973. Development of a hardwood stand in southwestern Ontario ten years after thinning. Ont. Dept. Lands For., Res. Div., Maple, ON. Unpubl. Rep. 15 pp.

Larsson, H.C., Jaciw, P. 1959. Hard maple thinning studies. Ont. Dept. Lands For., Res. Div., Maple, ON. File Rep. No. 7. 5 pp.

Appendix 1. Table of studies by location.

Location	Study
Algonquin Park	1.18.3 Algonquin polar plots
Algonquin Region	1.17.3 Algonquin regional growth study (ARGS)
Anglesea Township	3.27.1 Herbicide injection to release red oak
Archibald Township	1.26.3 Silvicultural calibration of Algoma/North Shore stands (SCANSS)
Armour Township	2.18.1 Mechanical site preparation for yellow birch regeneration
Bangor Township	3.07.1 Regeneration tally of red oak using shelterwood harvest with prescribed burning or manual tending to control competition
Biggar Township	2.20.1 Effect of deer browsing on yellow birch regeneration using three methods of assessing impact
Bracebridge District	1.30.3 Westwind shelterwood PGP
Brudenell Township	3.07.1 Regeneration tally of red oak using shelterwood harvest with prescribed burning or manual tending to control competition
Brule Township	1.26.3 Silvicultural calibration of Algoma/North Shore stands (SCANSS)
Bruton Township	2.13.1 Operational site preparation for yellow birch regeneration
Buchanan Township (Petawawa Research Forest)	1.12.3 Corry Lake single-tree selection
Buchanan Township (Petawawa Research Forest)	2.06.1 Group selection in tolerant hardwoods
Buchanan Township (Petawawa Research Forest)	3.01.1 Red oak establishment under white pine overstory
Cashel Township	1.21.3 Bancroft District PSPs
Dalhousie Township	1.20.3 Carleton Place remeasurement of Beckwith plots
Dalhousie Township	3.23.1 Biennial repeated burns for red oak regeneration
Euphemia Township	4.01.1 Black cherry natural regeneration
Eyre Township	2.10.1 Scarification blocks to regenerate yellow birch
Finlayson Township	1.33.3 Logging damage Stokes plots
Fullarton Township (Perth County, Stratford)	1.13.1 Sugar maple artificial regeneration
Gaudette Township	1.26.3 Silvicultural calibration of Algoma/North Shore stands (SCANSS)
Gibson Township	3.26.1 Comparison of artificial regeneration techniques for red oak
Gould Township	2.22.2 Yellow birch and sugar maple thinning
Guilford Township	2.11.1 Scarification strips to regenerate yellow birch
Havelock Township	2.10.1 Scarification blocks to regenerate yellow birch
Herschel Township	1.21.3 Bancroft District PSPs
Herschel Township	2.09.1 Regenerating poor quality, young hardwood stands with spring prescribed burns
Herschel Township	3.15.1 Preharvest red oak establishment using herbicides, underplanting and tending
Herschel Township	4.03.2 Basswood and sugar maple thinning
Hindon Township	3.14.1 Underplanting red oak stock in a Scots pine plantation
Hodgins Township	1.26.3 Silvicultural calibration of Algoma/North Shore stands (SCANSS)

Location	Study
Huntington Township	1.22.3 Domtar permanent sample plot
Hynes Township	1.28.3 Comparison of height-diameter vs. height-age as site indicators for overmature, uneven-aged stands
Hynes Township	2.12.1 Establishment of yellow birch
Juillette Township	2.16.1 Yellow birch permanent sample plots for regeneration assessment
Juillette Township	2.17.1 Yellow birch manual seeding in site prepared strip cuts
Laurier Township	1.14.2 Trout Creek thinning
Lavant Township	3.24.1 Operational prescribed burns to control competition and promote resprouting
Lavant Township	3.25.1 Operational prescribed burns to release red oak regeneration
Livingstone Township	1.34.3 Logging damage survey comparing season of harvest
Macaulay Township	3.06.1 Repeated prescribed burns for red oak regeneration
Macaulay Township	3.17.1 Group selection to promote mid-tolerant hardwoods
Macaulay Township	3.18.1 Strip cutting and artificial regeneration to establish red oak
McClintock Township	1.37.3 Sugar maple quality
McClintock Township	2.14.1 Regeneration tally of yellow birch
McClintock Township	2.21.1 Effect of deer browsing on yellow birch regeneration utilizing deer exclosures
McClintock Township	3.09.1 Red oak establishment under closed and shelterwood canopy
McClure Township	1.21.3 Bancroft District PSPs
Montgomery Township	2.16.1 Yellow birch permanent sample plots for regeneration assessment
Mulmur Township	3.05.1 Prescribed burning to renew red oak stands in Southern Ontario
Mulock Township	2.15.1 Yellow birch regeneration cuts
Nicolet Township	1.26.3 Silvicultural calibration of Algoma/North Shore stands (SCANSS)
Nightingale Township	1.31.3 Hardwood growth plots
Nightingale Township	1.32.3 Influence of logging damage on growth and development
Nipissing Forest	3.19.1 Evaluation of bare-root and container red oak stock types
Norberg Township (Turkey Lakes Research Area)	1.38.3 Turkey Lakes trial of SCANSS
Norberg Township (Turkey Lakes Research Area)	1.39.3 Management of tolerant hardwoods in Northern Ontario
North Bay District	1.35.3 Investigation of selection harvesting damage
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Wylie Township (Petawawa Research Forest)	2.08.3 Health condition of yellow birch

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